

G.F. MATHEWSON
G.D. QUIRIN

Fiscal Transfer
Pricing in
Multinational
Corporations



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G.F. Mathewson and G.D. Quirin

Fiscal Transfer Pricing in Multinational Corporations

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Preface

This study was undertaken in 1976 under the sponsorship of the Ontario Economic Council, and an earlier version was given limited circulation in 1977. The present version has been extensively revised and substantial new material added, notably in chapters 4, 5, and 8. The original chapters 5 and 6 now appear as appendices A and B.

The topic is one on which, for obvious reasons, it is impossible to obtain accurate empirical data. This fact need not, in our view, force the economist to engage in idle conjecture or remain on the sidelines and refrain from comment, because it is possible, with the pseudo-empirical methodology employed here, to infer the extent of a problem by numerical analysis of appropriately designed models. The parameter values were chosen with this objective in mind and, if anything, overstate the scope for transfer pricing.

Like the research design, the product is a joint one, for which both authors accept responsibility. Initial versions of chapters 1 to 4 and 6 to 9 were from Quirin, while Mathewson drafted chapter 5 and appendices A and B. We have successively revised one another's chapters to the point of sharing equally in the final manuscript.

We wish to acknowledge the helpful suggestions given by the Council's anonymous referees and also by our colleagues G.K. Helleiner and R.M. Bird. If they have been unable in all instances to convince us of our errors, any that remain are our fault and not theirs. We also wish to thank Eli Abssy and Charles Cohen, for their assistance in the empirical work, and Mary Brubacher, for typing too many versions of the manuscript.

FISCAL TRANSFER PRICING IN
MULTINATIONAL CORPORATIONS

1

Introduction

This is a study of the economic problems created by fiscal transfer pricing practices of multinational corporations and of the relevance of these problems in an international and a purely Canadian context. The problems are of three kinds: misallocation of resources and distortion of the pattern of economic activity, potential erosion of the tax base and reduction in tax revenues, and potential evasion of foreign exchange controls. Only the first and second are of current importance in Canada.

Most previous studies of transfer pricing have focused on tax evasion. While we do not wish to deny their importance, we believe the effects of tax evasion are primarily pecuniary and thus less damaging than the real costs imposed on the economy by resource misallocation. Particular attention is therefore directed at the latter.

We examine the institutional framework within which transfer prices emerge, the incentives to manipulate transfer prices created by that framework, and the constraints on manipulation it imposes. A theoretical analysis then demonstrates that multinationals may derive a comparative advantage over local firms purely on the basis of their ability to manipulate transfer prices. It identifies the nature of optimal transfer prices and the extent to which shifting in the location of real economic activity will take place in response to opportunities for transfer pricing.

Empirical analyses of transfer pricing have been severely limited by the paucity of available material. Transfer price manipulation by its very nature must be conducted under a cloak of secrecy. Virtually the only cases which come to light are disclosed as a consequence of prosecutions. As such they probably constitute a biased sample and are no more representative of general corporate practice in this respect than Monday morning appearances in magistrates' courts are representative of Canadians' weekend recreational activities. Both pictures are incomplete and cannot be adjusted closer to reality because the extent of the bias is

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unknown. The conclusions drawn from the sample are therefore apt to be coloured by ideological preconceptions. Those who view the business community as basically law-abiding but subject to human failings may well conclude that the prosecutions disclose the presence of a minority of law-breakers as well as a few unintentional victims of the vagueness and ambiguity of the governing legislation. On the other hand those with a highly developed sense of corporate evil may view the prosecutions as the tip of an iceberg, a few token victims accidentally caught and punished for acts that differ neither in kind nor in degree from the general practice within the group of which they belong.

In our view neither of these positions is particularly tenable. It is extremely unlikely that enforcement agencies detect all violations, nor even that they are able to prosecute all those that they detect, given staff and budget limitations. However, informal discussions with a number of professional practitioners in the tax field, both lawyers and accountants, suggest that most businessmen expend considerable effort to structure transactions so that they are well within the law, and that the proportion who are prepared to test the doubtful fringes of legality is quite small. As we shall see, however, a certain degree of manipulation is possible within the legal limits which are determined at least as much by considerations of enforceability as by economic logic. In economic terms, legally permissible manipulation is, because of general compliance, more apt to be a genuine economic problem than the relatively few cases involving flagrant violations. Empirical evidence on the extent of legally permissible manipulation is of course even scarcer than evidence on illegal transactions.

Because of these data limitations any direct empirical approach has been ruled out in advance. Our theoretical analysis, however, indicates that manipulation pays only under certain well-defined conditions, in terms of relative factor prices, factor intensities in the production process, and so on. Instead of a direct empirical approach we have instead adopted a 'pseudo-empirical' technique to delineate numerically the range of production opportunities within which it will pay to manipulate, given relative factor prices in Canada and the United States and the constraints imposed on behaviour by existing legislation in both countries. This range is then used to determine the maximum employment-shifting and other effects under the assumption that full advantage is taken of the opportunities thus presented.

Manipulation of transfer prices is possible only within a multinational organization and in the absence of arm's-length markets for the commodity in question.¹

1 There is a parallel problem of independent businesses operating across borders, which may collude to evade taxes, duties, or exchange controls by means of overbilling, underbilling, and otherwise falsified invoicing. These actions do not represent transfer pricing as the term is usually defined, since 'external' prices are involved, and are accordingly

We have therefore examined the structures of Canadian trade and attempted to identify those markets in which multinationals are unimportant, those in which they are important but ample competitive price evidence is available, and those in which a great deal of trade includes goods for which outside markets are of restricted importance. The latter category is surprisingly large in Canada's trade; our analyses suggest that 42.0 per cent of imports and 43.7 per cent of exports in 1974 were in commodities in which multinationals played an important role and in which arm's-length prices may have been unavailable, that is, in which the market structure preconditions for manipulation were present. However, because the scope for profitable manipulation was confined to a relatively narrow range of processes, the percentage of trade affected was a fraction of that suggested by these figures.

In later chapters we examine the problems created by transfer pricing of services and other intangibles (such as royalties and management fees), complications introduced in multilateral situations, and possible policy responses to the problem.

THE NATURE AND ORIGIN OF TRANSFER PRICING

Transfer prices may be defined as 'internal' prices at which goods or services are exchanged between constituent parts of an organization. They are thus to be distinguished from the external prices at which the organization conducts transactions with outsiders. Transfer prices may be 'real,' in the sense that the transaction to which they are applied is accompanied by a corresponding exchange of money or financial claims, if only in an intercorporate clearing account, or they may be purely nominal and used for cost accounting and internal control purposes only. In general, real transfer prices are applied in transactions between parent and subsidiary companies, or between common subsidiaries of the same ultimate parents, and may be applied in transactions between divisions of a firm with a decentralized financial control system. In present practice, the use of purely nominal transfer prices is largely confined to interdivisional or interdepartmental transactions within a single corporate entity.

Transfer prices are thus widely used in multinational organizations, which typically involve a parent domiciled in one country and a number of subsidiaries or, less typically, branches operating under other national jurisdictions. Their widespread use is primarily attributable to the growth of corporate income taxa-

ignored here. But they create similar problems. To the extent that such practices prevail in the independent trading sector and have been ignored here, we have overstated the extent of the problem created by multinational enterprises.

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tion and the need to ascertain tax liabilities, and therefore income, in the different jurisdictions in which the organization operates. Other types of taxation, and the operation of other controls, for example on foreign exchange transactions, may also necessitate the establishment and use of transfer prices.

The use of transfer prices has spread more or less in step with the adoption of relatively high rates of corporate income taxation and other forms of intervention in private business transactions during the present century and particularly since the second world war. In an earlier era, there was no need of the devices. In Canada's oldest multinational, the Hudson's Bay Company, operations during the eighteenth and nineteenth centuries involved sending out trade goods from the United Kingdom and the return of furs to be auctioned in London. There was limited movement of money or financial claims in either direction. The company simply owned the goods and moved them about internationally as it saw fit. This pattern of behaviour remained the norm in a number of multinational operations even into the 1950s. Thus, for example, the partners in the Iraq Petroleum Co. as recently as the 1940s simply remitted cash to make royalty payments to the local government and meet local payrolls, supplied equipment as needed, and loaded their respective shares of the oil produced into tankers for delivery to their refineries elsewhere. So did most of the oil producers in the Middle East (Adelman, 1972). The need to sell oil explicitly to the parents and keep a full set of corporate accounts for the jointly held subsidiaries only emerged with the advent of profit-sharing in the 1950s.

While international operations and the spread of income taxation have created an obvious need for transfer prices, similar needs may arise in a federal country where the constituent units apply their own income taxes, or when a subsidiary company has shareholders other than the parent to whom it is accountable. In either case there is a need for a determination of the income of the subordinate unit, as distinct from the global income of the parent organization.²

A third reason for establishing transfer prices arises when decentralized decision-making systems, organized around 'profit centres,' are established in an organization. These create a need to measure performance, i.e. income or return on investment, in the individual profit centres, and, where transactions between profit centres take place, it is necessary to establish prices in order to provide

2 In Canada the need for explicit transfer prices in interprovincial transactions in order to determine provincial corporate income tax liability has been obviated by interprovincial agreement to allocate total corporate income between provinces on the basis of sales and payrolls within the respective provinces. While this avoids an internal transfer pricing problem, it creates distortions of its own, particularly in the ability of provinces to create incentives within their respective corporate tax systems.

such a measurement. Appropriately chosen prices will ensure that operating divisions make optimal contributions to over-all profitability. Inappropriate ones may induce 'suboptimization,' in which profit-maximization within divisions is achieved at the expense of the profitability of the whole. An extensive literature on transfer pricing in this managerial context has emerged since 1950 (Dean, 1951; Hirshleifer, 1956, 1957; Gould, 1964). Transfer prices established for these purposes do not have to be 'real' prices in the sense described above and can be purely accounting prices with no counterpart in financial claims. Nor do they have any necessary relationship with the types of transfer price described earlier except in so far as internal transfer prices may be used by fiscal authorities as evidence in determining appropriateness of fiscal transfer prices. Transfer prices appropriate for internal control can be shown to be related to certain dual variables which can be defined when the problem of profit maximization in a complex system is expressed as a mathematical optimization problem in the face of certain constraints. Hence, they are sometimes referred to as 'shadow prices,' in reference to the usual economic interpretation of these dual variables as implicit per-unit values of relaxing the constraints by a marginal amount. To avoid confusion with other types of transfer prices, those constructed for internal control will be referred to hereafter as 'shadow prices.'

Transfer prices and shadow prices may be, and frequently are, set to equal prevailing market prices at which commodities are bought from or sold to third parties. While such prices are, technically speaking, 'transfer' prices in that no change in ultimate beneficial ownership takes place, it has become usual to restrict the usage of the term by considering market-based prices as 'arm's-length' prices. The term 'transfer prices' is then used to describe prices set for transactions which have no open-market counterparts. There are many such transactions, involving the sale of semifinished products, parts, or subassemblies for which no discernible market involving third parties exists, or where it exists but is disproportionately small in relation to the volume of intracorporate transactions.

2

Previous work on transfer pricing

Transfer pricing, or more precisely the manipulation of transfer prices to minimize fiscal liabilities, is not a new issue. However, until the general escalation in corporate income tax rates during and after the second world war it was primarily a problem of tariff administration. To the extent that it was recognized as a problem in contemporary economic literature, it seems to have been regarded as a part of the basic administrative problem of determining dutiable values and preventing undervaluation. In the classical literature on international trade, as well as in the public finance literature, there is a recognition that high tariff or tax rates make evasion in one form or another a profitable pastime. Undervaluation is seen, in this older literature, primarily as a technique of evasion, and its analytical consequences are not explored in any great detail except to note that evasion makes operative tax or tariff rates lower than nominal rates and leads to an equilibrium in which the resource-reallocating effects of a given nominal tax or duty are less than they would be if the operative rate were equal to the nominal rate. The potential savings from undervaluation create incentives for manipulation even on arm's-length sales between otherwise unrelated buyers and sellers, since there is a tax saving to be shared if an appropriate (illegal) agreement can be reached. Such agreements are difficult to reach and enforce if there are large numbers of buyers and sellers, and most easily effected where there is common control of buyer and seller. At the theoretical level, however, the problem has been largely ignored by economists.

It was not ignored by lawyers or by the draftsmen of tax or tariff statutes, who recognized the possibility of non-arm's-length transactions and modified legislation to cover them. Lawyers have perhaps had a less idealized view of the world than economists, who tend to regard all departures from the competitive model as anomalies. Where competitive markets exist, substitution of the prices they generate is an easy solution to the valuation problem faced by tax authori-

ties. But the problems of transfer pricing recognized in some of the early literature did not originate in fiscal objectives; they were an attribute of monopoly and one of the abuses associated with vertical integration, as witness the controversy over 'secret rebates' in the early history of the Standard Oil Trust (Tarbell, 1904).

The recognition that products might be differentiated to the point where a competitive price could not be found did not really penetrate economic literature until the 1930s. Although vertically integrated enterprises had been around in significant numbers for a century or more, there was little consideration given to this fact in the prewar theoretical literature, though it was certainly recognized in works on industrial organization. Many of the latter, however, were innocent of theoretical content.

As far as we can determine, the term 'transfer price' did not enter the general vocabulary of economics until the publication of two seminal articles by Jack Hirshleifer in 1956 and 1957. These were the first theoretical treatments of the problem of setting transfer prices between divisions of a decentralized firm in such a way as to ensure that profit-maximizing decisions taken at the divisional level contributed to global profit maximization for the firm. Such prices are shadow prices in the terminology of this study. At the more practical level, the technique (with some imperfections) had been introduced in General Motors in the 1920s (Sloan, 1963). Earlier examinations of the theoretical problem of setting transfer (shadow) prices to encourage decentralized decision-making units to contribute to global optimization, studies anticipating much of Hirshleifer's contribution, were found in the extensive literature on economic calculation in socialist economies, of which the contributions of Barone (1908) and of Lange and Taylor (1938) should be noted.

Though significant contributions to the literature on transfer pricing, these works did not seriously consider the implications of operation under two or more fiscal regimes, which is the essence of the problem examined here. Until the belated discovery of multinational firms by economists in the 1960s, the literature on this subject was dominated by the contributions of accountants and lawyers, essentially 'how to do it' descriptions of the constraints within which transfer prices, a legal necessity so far as transactions involving separate corporate entities are concerned, must be determined. The possibility that prices might be manipulated within these constraints and productive operations shifted correspondingly was certainly considered, but not in any systematic way. Now there is a vast literature on multinationals, most of it equivalent in analytic content to that on trusts in the 1920s or on labour in the 1930s. The existence of opportunities for transfer price manipulation is widely noted but nowhere carefully explored. It is dismissed as a problem by writers who view multinationals

as benevolent institutions created in the nick of time to save mankind from the excesses of narrow nationalism; its importance is grossly overstated by those who view multinationals as devices created by the last hangers-on of capitalism to subvert the expressed will of duly constituted and sovereign national governments. That identical behaviour should receive such different interpretations requires no comment here.

Attempts to deal with fiscally induced transfer pricing behaviour at a less dogmatic level are relatively few. There is some discussion of transfer pricing by Kindleberger (1970), and more detailed studies appear in doctoral dissertations by Shulman (1966) and Horst (1969). The problem is also discussed in the Watkins Task Force *Report* (1968), whose treatment, however, is descriptive and suggestive rather than analytical.

A major step towards analysis is found in Copithorne (1971), in which pricing and output decisions of a multinational, vertically integrated firm operating under alternative policy objectives are examined. The model considers three related firms, two of which produce inputs for the third. The effect of a variety of taxes is examined. The basic conclusion is that transfer prices are irrelevant in determining price-output decisions of multinationals and are determinate only in so far as the corporation is constrained or induced to move nominal profits from one jurisdiction to another. Tariffs and excise taxes may have price-output consequences, and these may be altered to some degree by transfer pricing opportunities. Viewing transfer prices as basically irrelevant to income taxation is a consequence of the assumption that corporate income taxes fall on pure economic profit and cannot be shifted, an assumption that Copithorne (1971, 329) notes is dubious. While the Copithorne paper represents a significant methodological advance over previous work on the subject in the international business literature, it deals with a special case under quite restrictive assumptions and makes a limited contribution to our understanding of multinationals' behaviour.

In a second contribution, Horst (1971) assumed the firm to be a monopolist operating in two markets with different fiscal regimes and a tariff barrier. Cost functions are given in the two economies and do not incorporate any element of the tax; hence the model is essentially one of short-run adjustment and assumes taxes cannot be shifted. As the underlying production functions are not specified and no provision is made for alteration of technological production choices, it is impossible to predict employment effects. The model is a useful extension of the received theory of discriminating monopoly to deal with a case that is of some relevance to transfer pricing. Its usefulness is limited, however, by its short-run focus and by its exclusive attention to monopoly. While monopolies doubtless exist, they are perhaps more relevant in the short than in the long run, and concentration on them leaves the misleading impression that transfer pricing

problems exist only in monopolized industries. As shown below, monopolized markets are not essential to transfer pricing, which can be expected to emerge even under competitive market conditions.

Horst's further work in this area (1975) examines the effects of particular provisions of US tax law, in particular the foreign tax credit and the deferral of taxes on income from foreign subsidiaries, using an expanded version of his basic model. As this work is not yet in final form, detailed criticism is inappropriate. Horst has also written a book on the problem to appear shortly, which will no doubt clarify many of the issues raised by US tax policy with respect to multinationals. Horst's basic analytical framework differs from that used here in that we have attempted to define the minimal sufficient conditions for the emergence of transfer pricing and have placed particular emphasis on long-run effects.

As noted, a vast accounting and legal literature exists on transfer pricing in an international context. While interesting on the mechanics of transfer pricing and its constraints, this literature does not lead to any significant behavioural generalizations and is not examined in detail here (see for instance Business International Corp., 1965; Price, Waterhouse and Co., various dates).

3

Legal and related constraints on transfer pricing

INTRODUCTION

In Canada and in most western countries there are, strictly speaking, no legal constraints on transfer pricing as such. For example, a corporation or individual owning commodities in Canada is, with minor exceptions, perfectly free to sell those commodities to any other corporation or individual in Canada or in another country for any agreed-on price, or even to give them away for no consideration at all. The only exceptions arise where export permits are required for certain types of commodities, such as oil, gas, electricity, uranium, nuclear power plants, and certain types of firearms, and where creditors may be defrauded as a consequence of placing assets beyond their reach. Constraints arise because in certain instances taxation authorities are free to substitute their own price for the price at which the transaction took place in computing liability for various kinds of taxation. Sales at prices which do not meet the standards set forth in the legislation, and which thereby invite such action by the taxing authorities, may attract double taxation or taxation at punitive rates.

For example, a Canadian firm may sell partially completed products to its subsidiary in the United States at an arbitrarily low price. If there were no constraints on such transactions, such a sale would reduce reported income in Canada and increase it in the United States. Liability for corporate income taxes in Canada and for US customs duties would be reduced, while liability for US income taxes would be increased. Even if corporate income tax rates were identical in the two countries, such a step would be advantageous because of the saving in customs duties. However, the prospective gains will often be reduced in practice, sometimes beyond the vanishing point, because 1/ customs duties may be assessed on a valuation corresponding to the fair market value of the product, eliminating the saving in duty; 2/ anti-dumping duties may be imposed; 3/ Cana-

dian tax authorities may deem the sale to have taken place at a price deemed 'unreasonable in the circumstances,' eliminating the saving in Canadian income tax; and 4/ US income tax may continue to be assessed on the income computed using the nominal price plus duties paid, thereby leaving the higher US income tax liability intact.

Unless it has an abnormal desire to enrich governments, the firm will prefer to set a price for the transaction which does not attract anti-dumping duties or substitute valuations by the Department of National Revenue. The range of acceptable prices may be much narrower than appeared at first glance. The desire to avoid taxation creates the incentive to manipulate transfer prices; the same desire serves to limit the extent of the manipulation. The extent to which it is limited, however, will depend on the extent to which firms wish to operate within the law (so far as it is ascertainable) and in turn on the probability of detection and punishment. Where enforcement is loose, the limits will be broader. The most important piece of missing information here is the probability of detection applicable in various enforcement systems to particular types of manipulation.

Ordinarily, as in the example cited, any international transaction between corporate affiliates will come under the (potential) scrutiny of at least three fiscal agencies, the customs officials of the importing country and the income tax officials of both countries. Where export taxes are assessed, customs officials of the exporting country may also be involved. The regulations that exist are intended, for the most part, merely to protect the integrity of the tax base and are not directed at the other economic effects which may ensue as a consequence of transfer price manipulation. Anti-dumping duties are a partial exception, because evidence of 'injury' to domestic producers may be considered in assessing the duty. The tax bases themselves, of course, may be designed to interfere with the pattern of trade. Tariffs in particular are often adopted primarily to exert such influences, with revenue-raising characteristics relegated to a poor second place. Certain aspects of income tax legislation, such as the provisions for Western Hemisphere Trade Corporations (WHTCs) and Domestic International Sales Corporations (DISCs) in the US Internal Revenue Code, may have a similar objective.

This chapter outlines the major legislation affecting transfer prices in Canada and a number of other relevant jurisdictions and seeks to indicate the manner in which the legislation is applied in practice.

CANADA

The relevant statutes of general application limiting transfer pricing are the Income Tax Act, the Customs Act, and the Anti-dumping Act. The Customs Act and the Anti-dumping Act apply to goods imported into Canada from a foreign

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parent, subsidiary, or affiliate; the Income Tax Act is relevant to import and export transactions and to payments for services in either direction.

It should be noted that the Income Tax Act also applies to the foreign operations of Canadian firms which operate abroad through branch offices rather than subsidiaries. The Act creates and determines tax liability according to Canadian rules on world-wide income and provides a tax credit for foreign taxes paid on income in any given country to the extent that such foreign tax does not exceed the prorata portion of Canadian tax payable on the income originating in the foreign country (section 126(2)). If the foreign tax is higher the aggregate tax burden is increased by the excess; if it is lower the Canadian tax is increased so that no saving results from the lower foreign tax rate. Under these circumstances the incentives to manipulate transfer prices appear to be relatively restricted, although an incentive remains to shift income from higher tax rate jurisdictions into Canada to reduce the excess otherwise payable to foreign taxing authorities. In most instances, except where the foreign operation is expected to operate at a loss for some time, it will be preferable for the Canadian firm undertaking foreign operations to do so through a foreign subsidiary, preserving thereby the benefits of lower foreign tax rates. The following discussion assumes that such is the case.

Foreign branch operations in Canada are of course subject to Canadian tax law here, though certain jurisdictions, such as the United States, allow Canadian tax paid as a credit in determining home country tax liability. Similar credits are obtainable for subsidiaries; foreign subsidiaries may not be consolidated for US tax purposes (though consolidation may be required in certain instances), but foreign tax credits are available against income remitted to the parent via dividends.

The critical sections of the Income Tax Act dealing with transfer pricing are sections 69(2) and 69(3). 69(2) provides that where payments to a non-resident exceed an amount which would be 'reasonable in the circumstances' if the transaction were at arm's length, the excess may be disallowed in calculating expenses. 69(3), dealing with exports, provides that where goods are sold below the price which would be 'reasonable in the circumstances' the difference may be added to sales in computing tax liability. In addition to these basic provisions, which concern specifically international transactions, other sections are of potential relevance. For example, section 245(1) provides that expenses which 'unduly or artificially reduce income' are not deductible. Like section 69(2), this would seem to restrict a company's freedom to raise transfer prices on non-arm's-length imports and expose the company to the threat, not of having a 'reasonable' price substituted as in section 69(2), but of having the entire expenditure on the imported commodity disallowed. Expenses, to be deductible, must be incurred to

produce income (section 18(1)(a)). It would appear that this section requires export sales, particularly in the non-arm's-length case, to be made at prices which more than cover expenses, otherwise the latter may be disallowed in their entirety.

Similar provisions are to be found in sections 36–44 of the Customs Act. The valuation criterion of the Customs Act is 'fair market value,' not the 'reasonable in the circumstances' criterion of the Income Tax Act, and it should be noted that the Customs authorities are concerned with keeping the valuations of non-arm's-length imports up while the Income Tax authorities are concerned to keep them down. The difference in language appears to have been inspired by a desire to keep open the possibility of imposing different valuations for different purposes as much as by the admitted difficulties of interpreting the 'fair market value' of unfinished products which may move across the border but are never in fact sold on the open market. There are reports, originating with tax practitioners, that on occasion the Taxation Division has attempted to impose lower valuations under section 69(2) than those imposed by the Customs and Excise Division of the Department. No cases involving such dual valuations appear to have been litigated, however, and it is reported that such conflicts, when they arise, have resulted in negotiated settlements in which the Customs valuation, which is usually more favourable for taxpayers paying the full corporate income tax rate, has been accepted by the Department. The latter appears to be unwilling to expose to judicial scrutiny any double standard it may apply internally. For practical purposes, therefore, 'fair market value' and 'reasonable in the circumstances' must be taken, at least at present, as equivalent.

It should be noted that there are no serious problems in the application of these standards in the great majority of transactions between affiliated corporations. In these cases the product in question is sold in comparable quantities to unrelated firms at the same level of distribution, on an arm's-length basis. Usually the fair market value is easily ascertainable, using the arm's-length transactions as evidence, and no serious problem arises. But difficulties may emerge even in such situations if there is significant disparity between the lot sizes sold in the arm's-length market and those sold to affiliates, or where there are differences in credit terms, and so on.¹ Problems may also arise when sales are made at different levels in the distribution channel, for instance when the parent sells direct to retailers but where the subsidiary provides wholesale distribution. Wholesale discounts normal in the trade tend to be applied on a relatively routine basis.

Somewhat greater difficulty emerges when the goods are unfinished or 'intermediate products' which are not sold by either the parent or the affiliate to any

¹ *J.W. Hofert Ltd v. M.N.R.* (1962) D.T.C. 50

arm's-length buyer. Similar goods sold by competitors provide a benchmark from which a valuation may be determined, taking appropriate account of differences in quality, distribution level, location, and terms of sale. Pulp moved across the border by an integrated paper company is not so different from market pulp that it is impossible to estimate fairly closely what it would be worth if sold as the latter.²

Where neither arm's-length sales nor competitive commodities are available as a measure, resort will ordinarily be had to cost accounting studies as evidence of value. It is here that disputes are most likely to arise, but there is surprisingly little litigation on the subject, at least as far as international transactions are concerned. The Department will apparently accept, as evidence of cost, any cost accounting computation consistent with existing accounting practice in the industry and with accounting rules the Department applies elsewhere. Costs will be 'fully distributed costs' with overheads allocated on any of the arbitrary bases accountants are prepared to accept, providing the allocation basis is consistently used in the firm or the industry. While such costs may not always be appropriate, the Department is to a considerable degree bound by precedents it has set elsewhere. For example, sale of an intermediate product incorporating a raw material that has increased sharply in price at a price which does not reflect the increased market value of the raw material can scarcely be opposed by an agency which has shown unrelenting hostility to LIFO inventory accounting, even if the higher price would in fact be more likely to prevail in an arm's-length market.

Valuations derived from cost studies tend to include, at least for imports, more or less arbitrary profit margins in addition to fully distributed costs. Such markups may be calculated with reference to prevailing markups in the industry, or with an eye to ensuring that equal markups are applied at home and abroad, but are often set at 10-15 per cent, which presumably reflects the Department's application of some vague 'just price' concept. Except when comparative data are available and accepted, there appears to be, at least, limited attention paid to relative capital intensity in determining the markup to be applied in determining fair market value, a reasonable price in the circumstances. A 10 per cent markup in a merchandising operation turning over its inventory thirty times a year, will produce a rate of return of 300 per cent on invested capital, but in a public utility which turns over its capital every five years, it will bring a rate of return of only 2 per cent. While most cases in which markup rules are applied fall well within these extremes, there is little to suggest that the rules are reasonable or

2 The most favourable source will ordinarily be evidence of value, where significant differences in prices of arm's-length sales exist. See *Dominion Bridge Company Limited v. The Queen* (1975) C.T.C. 2 63, 75 D.T.C. 5150.

even consistent with the prices which would emerge in an arm's-length competitive setting.

THE UNITED STATES

Constraints on transfer pricing on multinationals' transactions involving movements of goods and services into, or out of, the United States are governed by a system similar to but somewhat more complex than, that found in Canada. Value for customs purposes is governed by sections 402 and 402A of the Tariff Act of 1930, as amended in 1956, which provide seven different valuation criteria for imports. The basic criterion is the price of which the product, packed for shipment, is sold under open market conditions in the country of origin, referred to as 'export value.' The applicable criterion in non-arm's-length sales, where comparable market value data are not available, is Constructed Value (s. 402) or Cost of Production (s. 402A). The former is defined as production cost, plus an allowance for general expenses and profit at rates usual to producers of similar merchandise in the country of origin, plus packing costs. The latter, applied to a limited range of commodities, requires successive add-ons to production cost of at least 10 per cent for general expenses and at least 8 per cent for profit. Production cost includes allocated factory overheads. In certain cases where finished products are involved the American Selling Price system of valuation, in which competitors' selling prices in the US market are used, may also be applied. These rules have been well established for years and appear to be administered smoothly with relatively little controversy. The major controversies over US customs valuation in recent years have arisen over the retention of the American Selling Price system and over application of anti-dumping duties, not over the principles applied to the internal transactions of multinationals.

The latter, however, are the focus of attention under the transfer pricing rules contained in s. 482 of the Internal Revenue Code, which provides that, where comparable uncontrolled prices, that is, on arm's-length sales, exist, they will be used as the criterion of reasonableness. Where they do not, such as when the parent or subsidiary is the sole customer for a particular product at a given level in the distribution chain, the resale price minus an appropriate markup becomes the governing criterion. Failing this, a cost-of-production yardstick is used, with 'an appropriate gross profit' percentage added. Even more arbitrary rules may be applied in practice if there is evidence of intent to evade taxes in the transaction.

Where the items transferred are component parts or subassemblies, or where for other reasons it is inappropriate to use resale prices, a cost-plus method, in which an appropriate gross profit percentage is added to production costs, is employed. Finally, it should be noted, other methods deemed reasonable by the

revenue authorities which do not appear to reduce tax liabilities in the United States may be employed, with the burden of proving their reasonableness shifted to the taxpayer. For example, US authorities are unlikely to quarrel with an allocation system in which all the multinational's income appears in the US company and is taxable there.

While there have been situations in which transfers at cost have been upheld by the courts on the ground that no realization took place until the goods were sold to a third party,³ the requirement that a markup be added is more usual. In the *Pittsburgh Plate Glass* case the IRS attacked an arrangement whereby goods were sold to a subsidiary at a 10 per cent markup over cost, contending that the resultant profit to the subsidiary was excessive, but was unable to convince the Court.⁴ In an earlier case a transfer price based on direct manufacturing costs plus allocated manufacturing overhead, delivery charges, and a 6 per cent markup thereon had been upheld by the Court of Appeals.⁵

The governing rule in the question of markups on cost seems to be that established in the *Eli Lilly* case.⁶ The company had transferred products to one of two affiliates organized to handle export sales at manufacturing costs, plus royalties to third parties, plus certain direct service costs. Resales to the second affiliate were made at cost to the first, including overheads but no profit. This procedure was adopted in 1952, replacing an earlier policy in which a 60 per cent discount below domestic prices on packaged merchandise and a cost-plus-5 per cent price for bulk merchandise was used. The subsidiary was unprofitable on the earlier basis. The IRS objected because it believed excessive profits were being accumulated in the second subsidiary, a Western Hemisphere Trade Corporation not immediately taxable in the United States. Although there was evidence of arm's-length sales in bulk at prices below those charged the affiliate, these were dismissed as 'casual,' and a reassessment was upheld in which a profit margin equal to one-half of that obtained on domestic sales was applied to the subsidiary. The one-half margin was used because it was recognized that the subsidiary, as a major purchaser, could obtain significant quantity discounts if operating independently.

A resale price standard was used in the *Jesse Hall* case in 1958, where there was clear evidence of sales to other parties and a comparable discount was applied on sales to the subsidiary.⁷

3 *Re Huber Homes Inc.*, 55TC 589 (1971)

4 *PPG Industries Inc. v. Commissioner* 55TC 93 (1970)

5 *International Canadian Corp.* 308F. 2d 520 (C.A.9, 1962)

6 *Eli Lilly and Company v. U.S.* 372 F. 2d 990 (1967)

7 *Jesse Hall et ux. v. Commissioner* 32TC 390 (1959) aff'd. 294 F. 2d 82 (1961)

EUROPE

Outside North America there is considerable unanimity on the question of customs valuations. Most countries adhere to or follow the 1950 Brussels Convention on Valuation of Goods for Customs Purposes.⁸ The criterion is normal prices in arm's-length sales, on condition that price is the sole consideration. Where this criterion is not met revaluation may occur. For example, goods shipped to a distributor who is expected to advertise them will, in many of these countries, be revalued upwards to reflect the value of the non-price consideration (the advertising) whether the distributor is a subsidiary or not. Provision of services by the local affiliate does not warrant an additional discount.

Comparative prices at which the same or similar merchandise is offered to buyers in the importing country by sellers in the exporting country form the starting point of the valuation. The sellers' own prices are considered first, then prices of other sellers in the country of origin, then those of other sellers elsewhere. However, the valuation sections are carefully worded to permit geographic price discrimination by sellers; only sales to other buyers in the importing country are relevant.

The rules as drawn do not appear to make separate provision for sales of the parts, subassemblies, and other semifinished manufactures which are such a prominent feature of North American trade. These, of course, move on a duty-free basis between EEC members. Where other countries are involved, an extension of the treatment of advertising allowances, reductions below final product prices to reflect costs of packaging, assembly, and so on would appear to be vulnerable. In practice it appears that companies seeking to move such incomplete products can negotiate a transfer price acceptable to the authorities in the importing country on the basis of accounting and related evidence, and that this arrangement will be honoured in the administrative process. However, most legislation appears to give administrators sufficient power to negotiate from strength in such situations, including effective power to deter the movement if desired.

8 The following are reported to be formal adherents of the Convention as of 1974: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany (F.R.), Greece, Haiti, Ireland, Italy, Ivory Coast, Japan, Kenya, Luxembourg, Netherlands, Nigeria, Norway, Pakistan, Portugal, Ruanda, S. Korea, Spain, Sweden, Tunisia, Turkey, Uganda, UK, Yugoslavia. These countries account for 64 per cent of world imports. Another 54 countries, accounting for 7 per cent of imports, are not full members but are reported to use the valuation rules in practice. These include, inter alia, Argentina, Chile, Colombia, Czechoslovakia, Hungary, Israel, and Singapore. For a complete list see Verlage (1975), 94).

Within the European Economic Community concern over valuation for customs purposes extends only to imports from outside the community, since movements within are duty-free.⁹ In general, revenue considerations have been subordinated to control of trade patterns as the underlying *raison d'être* of customs legislation. Differences in protectionist sentiments exist within the community, however, and the existing provisions for arbitrary revaluation of non-arm's-length transactions with outsiders are more apt to be applied in rigorously protectionist countries such as France, but only if there is direct competition with local suppliers. In such instances a variety of other administrative measures intended to discourage unwanted imports may also be applied. Where there is no such direct competition, low import prices on intermediate products or raw materials, however caused, tend to be seen as improving the competitive position of local users. There are important differences in the strictness with which tariff legislation is applied which go beyond the policy level and relate to the integrity of the customs officers. Standards in some EEC countries are in this respect quite comparable to those in North America, but in others they are not, and it is possible to influence valuations in ways not always contemplated by the drafters of the legislation. Customs valuations have no influence on transfer pricing in transactions within the Common Market, and, while they may provide effective constraints on transactions with outside countries in some instances, the laxity in enforcement standards in some countries and the possibility of running transactions through such countries limits the general effectiveness of such constraints.

There is, however, much less uniformity in income tax legislation. In Belgium and West Germany there are explicit decisions to the effect that customs valuations are not binding (Verlage, 1975, 107-10). The general concern, of course, is with the possible avoidance of taxation, and most jurisdictions give tax administrators or tax courts substantial powers to impute income to local subsidiaries or parents in situations where tax evasion or even avoidance seems to be involved. Jurisprudence on the problem is fairly well developed in the United Kingdom, Germany, France, Holland, and Belgium, though it is perhaps less extensive there than in North America. In other parts of Europe tax administrators appear to have rather more arbitrary powers, and liability is often established after bargaining. Bargaining is of course a factor in the jurisdictions mentioned above and even in North America, but there appears to be much more scope for it elsewhere.

The ambitious program of fiscal harmonization within the EEC has led to an increasing reliance on the value-added tax (VAT) and reduced emphasis on other

9 Valuation problems on intercommunity sales still exist insofar as excise taxes are applied on an *ad valorem* basis, and, more generally, with respect to liability for value-added tax. The latter is discussed in chapter 8.

forms of corporate taxation. Effective corporate tax rates are generally lower than in North America, not only because of lower nominal rates but also because of more generous capital cost allowances and, in some instances at least, laxer enforcement. Given lower tax rates, the incentive to understate transfer prices on exports or to overstate them on imports is non-existent for firms involved in transactions with North American jurisdictions. There is of course an incentive to do just the opposite, though customs valuation considerations tend to limit it.

In addition, it should be noted the tax philosophies of EEC countries differ from those of North America in an important respect. The North American preoccupation with transfer prices in the corporate income tax context implies a concern that foreigners bear their 'fair share' of the tax, since the tax is shifted in the long run. If export sales do not make a suitable contribution to the Canadian treasury, Canadians are prepared to forgo the sales. The basic thrust of European tax legislation in recent years has been to define a tax base which is coextensive with the domestic population. This is most clearly seen in the application of the value-added tax, in which export sales are exempt while VAT paid on all domestic purchases may be claimed as a credit against tax payable on domestic sales. The effect is to exempt the entire domestic content of export sales from VAT. While the Europeans are not unwilling to have foreigners contribute to domestic tax revenues via corporate income taxes on exports, one suspects that, faced with a choice between the tax revenues and the exports, they would choose the exports. In this context we would expect to find that the constraints imposed by EEC members on transfer pricing involving exports from the EEC to be of minimal significance. To the extent that there is a potential problem in Canada it is more apt to be serious on transactions involving imports from EEC affiliates than on those from US affiliates. It is perhaps fortunate that much of our trade in component parts and unfinished commodities involves the United States.

LESS DEVELOPED COUNTRIES

A number of less developed countries (LDCs) are signatories of, or informal adherents to, the Brussels Convention. Major non-adherents include most of the members of the Organization of Petroleum Exporting Countries (OPEC), particularly Iran, Saudi Arabia, Kuwait, Abu Dhabi, and Venezuela. Transfer pricing problems in the so-called third world countries have most typically centred on prices paid for raw materials exported from such countries. Most of the members of OPEC have had running disputes during the 1950s and 1960s with the exporters of their oil and, in the case of Venezuela, iron ore. Similar complaints have arisen in Jamaica over bauxite. A significant fraction of the output in all these

cases was supplied to corporate affiliates. While it is customary to characterize such economies as raw-material-production-oriented, some have an important role also as host countries for manufacturing operations of multinationals. The electronics industries of Korea, Taiwan, and Singapore and the pleasure-boat building industry in Hong Kong are cases in point. In general, however, fiscal systems of such countries are underdeveloped by western standards; tax rates are low; and few, if any, constraints have been placed by the authorities on transfer pricing practices of multinational manufacturers operating within their territories. Their own trading patterns are governed in many instances by quotas and exchange controls rather than by the more indirect use of tariff or tax incentives, and their trade with the West has attracted similar devices in response. Most are anxious to industrialize and quite willing to forgo tax revenues to secure manufacturing exports.

While underpricing of manufactures for export is quite acceptable to third world countries, underpricing of raw materials is not. It is an article of faith in most LDCs that their raw material exports are underpriced even when sold at arm's length in open markets, and deep suspicion attaches to such trade when carried on by multinationals. There has been a tendency to scrutinize very closely prices received on exports of primary commodities and to substitute open market prices for actual transaction prices in appropriate circumstances. This is, of course, impractical in the case of certain commodities where no significant free market exists, such as in the case of bauxite. While the fiscal systems of many LDCs are rudimentary, those portions dealing with multinational raw material producers are no longer so.

The history of pricing in crude oil is interesting as an illustration of the evolution of legislation on the pricing and taxation of raw materials. Until the second world war, competitive markets for oil existed only in North America and to a lesser extent in Western Europe. Prices outside these areas were tied to US 'posted' prices by the so-called Gulf-plus basing point system. There were no posted prices in the Middle East whatever, and Venezuelan prices were tied to Gulf of Mexico price. Existing concession agreements in the Middle East involved payment of cash royalties in gold on a volumetric basis tied to shipments. The effective transfer price for shipments from the Middle East was the tax. In Latin America the share of production accruing to the host government as royalty was apparently paid for at the Gulf price, with some adjustments negotiated with local taxing authorities on freight allowances, and so on. The real need for a transfer price emerged with the development of the 50-50 profit-sharing formula in the 1940s, which made it necessary to sell oil produced in individual countries in order to define local tax liabilities. Before the 50-50 formula, royalties and any applicable taxes paid to host governments were deductible as expenses by

us companies but not eligible for Foreign Tax Credit treatment. Establishment of a posted price in the Middle East was forced not only by the switch to 50-50 but also in order to settle a dispute with the us Economic Cooperation Administration over the value of oil shipped to Europe as Marshall Plan aid.

Difficulties with the system emerged during the 1950s when tanker rates dropped and competition developed between Middle Eastern and Latin American crudes in the eastern North American market. The maintenance of a multiple basing point system in the face of competitive forces and variable transportation proved costs to be difficult, if not impossible. Posted prices remained in existence, but actual prices departed from postings in response to normal competitive pressures. The system of posted prices was not scrapped altogether because of opposition from the producing countries to any decrease in prices and their insistence that tax liabilities be computed on the basis of posted prices and not on actual realization. When the posted price of Venezuelan crude was cut, the Venezuelan government introduced legislation in 1967 establishing a 'tax reference price' to be set unilaterally by the Ministry of Mines and Hydrocarbons and used in calculating tax liabilities. Although the tax remained in name a tax on income, it was in effect an excise tax of a specified dollar amount a barrel. The income tax format was retained, apparently to enable us companies operating in Venezuela to claim Foreign Tax Credits, which are available for income taxes but not for excise taxes, which had to be expensed.

The disagreements between Venezuela and the international oil companies are sometimes depicted as disputes over transfer pricing. In fact this does not seem to have been the case. A large proportion of Venezuelan crude output was sold to corporate affiliates of the international producers at posted prices. It was arm's-length sales below posted prices by the internationals to non-affiliated buyers and by independents with no affiliated refineries that set off the dispute. By 1970 most of the other oil-producing states had legislation similar in effect if not in form to that in Venezuela. Most were at that time unconcerned about the actual price at which the oil moved to market as long as they obtained their appropriate revenue share. Venezuela was an exception, apparently because of its concern that price cuts in third-party markets could undermine the price structure and force a reduction in the tax-reference price. Since most of the producing countries have now nationalized the industry in one way or another, transfer pricing has ceased to be a factor in oil.

Venezuela also established a tax-reference price for iron ore in its 1967 legislation. Unlike oil, there is little open-market trading of iron ore, and most is produced by 'captive' mines owned by steel producers. Some question over transfer prices was involved in Venezuelan iron ore, and the tax-reference price, unlike the oil price, was intended to reflect arm's-length values.

Another mineral even less frequently traded at arm's length than iron ore is bauxite. There have been chronic complaints from certain bauxite-producing countries that the transfer prices used to establish tax liabilities to the host countries are too low and companies have played off one country against another to keep them that way, that is, they are competitively determined. Whatever the merits of this view, it has been at least temporarily resolved by the formation of a cartel along OPEC lines which has unilaterally raised transfer prices.

These examples suggest that many of the primary producers feel they have a problem with transfer pricing, whether or not they do, and that they have resolved it by a variety of devices which in effect result in the adoption of excise taxes rather than true income taxes. The former are probably more easily administered and represent a sensible resolution of the problem from the host country's point of view. However, in many cases the form of income taxes has been retained because US companies, operating in competitive markets, can pay approximately twice as much, per unit, in income tax form than in excise tax, because of the structure of the US Foreign Tax Credit.

Two other areas of concern over transfer pricing have emerged in LDCs: the pricing of imports that compete with local industrialization plans and pricing (transfer or otherwise) intended to evade exchange controls or controls on capital movements. Many LDCs have attempted to promote local economic development by providing protection to domestic import-competing industries often at extremely high effective rates. The high rates themselves create significant incentives not only for multinationals to manipulate transfer prices but also for local traders to smuggle or to conspire with foreign suppliers to provide false valuations. Given relatively ineffective, and frequently corrupt, administration of customs operations, the incidence of such transactions appears to be fairly high in some countries. Although the burden of criticism has been directed against multinationals, which epitomize capitalism to local politicians who are often at least nominally socialist, it is by no means clear that they are the major offenders. The problem really is the more general one of ineffective or corrupt administration of tariff legislation of dubious appropriateness.

The capital movement problem is similar and usually relates to illicit capital exports, achieved either by underpricing exports, over-pricing imports, or simply delaying the collection of receivables. There is little doubt that multinationals have resorted to such techniques from time to time, particularly in unstable areas where the risk of asset seizures appeared imminent. Once again the problem is not confined to multinationals and has been employed by a variety of entrepreneurs engaged in import or export operations, for instance by Asian traders in Uganda. Though this loophole is doubtless frustrating to local planners contemplating the seizure of foreign or domestic assets, such opportunities pro-

vide a second line of defence for foreign investors who may have reason to suspect promises of free repatriation. Without it there would be much smaller capital inflows and fewer assets to seize. For political reasons multinationals make good targets because they are obviously foreign. But it is by no means clear that they are the only offenders or even the most serious ones.

These complaints, and those over raw material prices, suggest a general unwillingness to accept arm's-length competitive prices as an appropriate criterion of value and a view that foreign investors have an obligation to contribute property on demand to assist in the development of LDCs. Unless such views are accepted as defining an appropriate set of ground rules for international transactions, complaints based on them should not be taken too seriously.

4

A simplified theoretical model

THE MODEL

The model in this chapter has been constructed to indicate the response of a multinational firm, and of unrelated national firms dealing at arm's length, to a variety of fiscal measures. The model is deliberately artificial because its objective is to show in the simplest possible form the nature of the problems involved. Thus, only two countries are assumed since the problem emerges in a two-country context. Competitive pricing is assumed, not because monopolies do not exist but because the existence of monopoly merely complicates the mathematics without altering the nature of the fundamental response. A simple form of production function, exhibiting neither economies nor diseconomies of scale, is employed for essentially the same reason. Trade patterns may be complicated by the existence of economies of scale, but a model which makes trade flows dependent on their existence lacks generality and may well yield conclusions dependent on the existence of what is a relatively rare phenomenon. Similarly, transport costs are neglected. In any country which is long and narrow, in which interior transport costs may exceed transport costs between some local markets or producing areas and their foreign counterparts, it is likely that some trade flows will emerge as a consequence of nothing more than transport-cost differentials. Classical trade theory has focused, however, on the trade flows which take place in the absence of transport-cost differentials and has regarded these as more fundamental in some sense than those which are dependent on them. We follow this tradition simply because we are interested in exploring what can be said about transfer pricing within the context of the classical trade model with no additional assumptions other than the interposition of certain fiscal measures and the possible use of the multinational form of organization. As will be seen below, these condi-

tions are sufficient for the emergence of a transfer pricing problem provided there are differences in factor prices between the two markets. Such differences in fact exist, and while transport-cost differentials might provide an alternative set of sufficient conditions for the emergence of a transfer pricing problem even in the absence of factor-cost differences, the analysis of such a model would involve developing theory for theory's sake, to explain a situation which has no real counterpart. We may be interested in the complications created by the existence of economies of scale or transport-cost differentials in a world where factor-cost differentials exist; but these are treated as additional factors which will complicate the basic model and will be examined later.

Trade may also flow in response to differentials in technology, that is, the production possibilities open to firms in one country from given inputs may differ from those available to producers in the other. The fact that multinationals provide an efficient mechanism for the transfer of technology has often been cited as a factor in their growth, but the fact that alternative technology-transfer systems exist and the existence of multinationals in industries where such alternatives are widely used and no technological superiority in the home country can be assumed suggests that technology transfer is not a necessary condition for their emergence. It is therefore assumed in this section that identical technology is available in both countries.

More formally, we assume

- 1 Two countries;
- 2 A single final product, sold in both markets, production of one unit of which involves the combination of one unit of the output of each of the nine different processes (i.e. fixed production coefficients).
- 3 Production functions for each of these processes are identical in both countries and are Cobb-Douglas production functions of the form ($Q = AK^aL^{1-a}$) where K and L are inputs of capital and labour respectively, A is an arbitrary constant, and Q is output in units. The processes differ in relative capital intensity, and a takes values 0.1, 0.2, 0.3, ... 0.9. Processes are identified by a subscript ij where $i = 10a$ and j denotes the country where the process is carried on. Thus, for example,

$$\begin{aligned} Q_{1j} &= A_1 K_{1j}^{0.1} L_{1j}^{0.9}, \\ Q_{2j} &= A_2 K_{2j}^{0.2} L_{2j}^{0.8}, \end{aligned} \tag{1}$$

and so on. Because one unit of output from each process is used in a unit of the final product, we have the further condition

$$\begin{aligned}
 (Q_{11} + Q_{12}) &= (Q_{21} + Q_{22}) = (Q_{31} + Q_{32}) \\
 &= \dots = (Q_{91} + Q_{92}).
 \end{aligned}
 \tag{2}$$

4 There are no transportation costs. The processes are carried out in sequence, each stage of which involves the incorporation of output from previous stages and the addition of additional value. Since there are no transport costs, the order of these stages is assumed to be irrelevant.

5 There are differences in factor costs, that is, costs of labour and capital, between the two countries.

6 Production is assumed to be carried out either by independent companies in each country or by a multinational. Prices are competitively determined either by the existence of actual competitors or the availability of potential competition, to the extent described below.

7 Long-run adjustment, that is, no excess capacity in either country.

The consequences of abandoning the assumption that there are no economies or diseconomies of scale are examined in the concluding section of this chapter.

COMPARATIVE FACTOR COSTS AND THEIR IMPLICATIONS

The production functions above specify technological possibilities which are identical in the two countries. By themselves, they tell us nothing about the optimum choice of technology for each of the processes, cost levels, or the location in which a given activity will be carried out. All these matters depend not only on the available technological options but also upon the relative costs of the factor inputs needed to carry out the process in question. Knowledge of these costs, together with the production function, enables us to specify which combination of inputs will produce a given output most efficiently in a given location, what the cost will be in that location, and in which location production will be carried out. The range of α -values in the postulated production functions has been deliberately chosen to be unrealistic, to cover a range of possible technologies wider than that likely to be encountered in practice, so that the implications of transfer pricing phenomena for any technologies likely to be encountered in a given economy may be explored.

The factor prices used in our analyses are intended to reflect approximate values in Canada and the United States in the early 1970s. This period was chosen rather than the mid-1970s because it represents the most recent period in which the historic pattern of relative capital and labour costs in Canada and the United States is clearly evident and relatively stable. Historically, labour has

been cheaper in Canada and capital cheaper in the United States. By the mid-seventies there was substantial evidence that both capital and labour had become more expensive in Canada at prevailing exchange rates. Under such circumstances Canada retains no comparative advantage except in natural resource products, in which other factors of production are important. Barring a movement in exchange rates, Canada's exports will tend to become restricted to natural resource products, and to those manufactures where unique technology or peculiar locational advantages offset factor-cost disabilities. In short, international competitiveness has been lost.

Such a condition must be viewed as inherently unstable, given the present industrial structure and an inability to employ the available force in primary industries. Competitiveness can be restored by an appropriate exchange rate adjustment, which makes the more abundant factor cheaper in each country, and such an adjustment will tend to occur under a freely floating exchange rate. The drop in the Canadian dollar beginning in the summer of 1977 may be viewed as a somewhat overdue adjustment of this nature, delayed by official intervention in exchange markets and by the need to accommodate capital inflows associated with borrowing abroad by government agencies. Since it is not yet clear that the present exchange rate is compatible with contemporary factor costs, the earlier period was chosen.

While considerable attention has recently been paid to wage rates in Canada and the United States, the labour cost relevant in the factor-cost context is total labour cost, inclusive of payroll taxes, fringe benefits, and so on. Though data on wage rates are readily available, information on fringe benefits and related non-wage costs is less dependable, though these change more slowly. For purposes of this analysis we have used the average weekly wage in manufacturing in Ontario as reported by Statistics Canada and the average weekly wage in the United States as reported by the Bureau of Labour Statistics. Both have been converted to an hourly basis, using reported data on hours worked. Data used are for 1970. Estimated fringe benefits for the same year have been added as a percentage of wage cost, based on data reported by the statistical agencies. It should be noted that fringe benefit levels are estimated by sample survey techniques at infrequent intervals.

The resulting estimates of labour costs per hour are

	United States (\$US)	Canada (\$Can)
Wage	3.91	3.35
Fringes	0.45	0.27
Total	4.36	3.62

Estimation of the costs of capital inputs is somewhat more difficult. Costs of capital assets are generally reported as total costs of acquiring the asset, a sum which is the capitalized (present) value of the costs of using it during its economic life. Such costs are not expressed in terms of costs per unit time. As labour costs on a capitalized basis are not readily available in countries where slave markets have long since disappeared, it is necessary to convert capital costs to dollars per unit of time, preferably per hour. Several factors affect relative capital costs per unit time. These include the cost of the capital equipment itself, including import duties and other taxes as applicable, and the cost of the money tied up in the asset while it is in use.

Relative costs of different types of capital assets vary between Canada and the United States for a variety of reasons. Imported machinery is subject to duty at varying rates; construction costs differ because of differences in construction wage rates, climatic conditions, differences in building codes, and the 11 per cent federal sales tax on building materials. We have not attempted to determine the average effect of these differences on all types of assets, since the cost of such an undertaking would be prohibitive. We have instead used, as a figure intended to be representative of a fairly wide variety of light manufacturing industries, an estimate of the relative cost of plant and equipment for the appliance industry in Canada, which was prepared for a study sponsored by the federal Department of Industry (Quirin et al., 1970). This study indicated that the capital cost of an appliance plant in Canada was approximately 15 per cent higher than the cost of a similar US plant.

The cost of using a plant in Canada is affected not only by the initial cost of the plant itself but also by the cost of funds. A great deal of confusion exists about how the cost of funds to the corporate sector should be measured. There is general agreement that marginal cost of capital to a firm is an opportunity-cost concept which should be identified with the rate of return a firm must expect on funds invested in an asset in order to justify its acquisition rather than the alternative of returning the capital to the investors in the firm (Fisher, 1930; Solomon, 1955; Gordon and Shapiro, 1956). In a world of certainty this rate can be readily identified with the prevailing rate of interest on long-term debt, since there is no difference between equity and debt financing in such a world. This has led many economists (such as Horst, 1969, 1971) to identify the marginal cost of funds with 'the' long-term interest rate. While the certainty model has been fruitful in many areas of economics, its application in this context is singularly inappropriate since the essence of the corporate financing problem is the management or 'packaging' of risk. Once the uncertainties of the real world are admitted to the analysis the equivalence between debt and equity disappears, and equity becomes more risky by virtue of the residual nature of its claim on

earnings and assets. In reflection of differences in risk, a multiplicity of required yields appear in the market place not only between bonds and shares but within these categories as well, reflecting the risk characteristics of individual issues. In such a world it is no longer possible to finance exclusively by borrowing, and while borrowing may permit incremental additions of funds in the short run, long-run increases in capital employed will ordinarily involve increases in both debt and equity, the latter required to provide a safety margin for creditors. The long-run marginal cost of funds therefore must reflect the cost of the incremental debt-equity package.¹

In order to estimate typical costs of funds for manufacturing enterprises we must first obtain estimates of the costs of debt and equity capital and then weight these to reflect the proportions in which these sources of funds are used. Conceptually, there is little difficulty in obtaining estimates of the cost of debt funds. These are usually raised by selling bonds or debentures or as term loans from banks and other institutional lenders. Bond interest payments and repayment dates are fixed, so that it is possible, using bond tables, to determine required yields by an examination of selling prices for bonds, and published series are available. However, a question is which series should be used. The typical manufacturer is not a prime credit; Aaa ratings tend to be confined to strong utilities and a handful of blue-chip industrials. In terms of the rating scale used by Moody's Investor's Service in the United States, the bonds of a typical manufacturing enterprise are apt to be rated Baa (the lowest 'investment' grade) or Ba (the highest 'speculative' grade). Yields for Aaa and Baa corporate bonds are regularly reported in the United States but not those for Moody's Ba bonds. United States rating agencies do not rate Canadian bonds (except for a few issues payable in US dollars), and while Canadian ratings exist they are not directly comparable with US ratings. The only statistical series on corporate bond yields available in Canada is that compiled by McLeod, Young, Weir and Co. (hereafter referred to as the MYW index), in which although bonds are not classified by ratings the index is dominated by the issues of prime borrowers. It is consequently more comparable with Moody's Aaa series than with the Baa series and cannot be directly used to infer borrowing costs for typical manufacturing firms. Table 1 reports the values of the Moody's and MYW indices for the period 1971-4. After allowing suitable differentials over the Baa index in the United States

1 Quirin (1967, chap. 6). There is an exception, but it is only an apparent one. A company with no debt or significant unused borrowing capacity may expand using debt only. In such a case the marginal cost is the interest rate on the debt plus the required additional yield on the equity which results from the increased riskiness of the latter created by the increased debt-equity ratio. For the equivalence of this case to the 'package' case discussed in the text, see Quirin (*ibid*).

TABLE 1
Long-term bond yields, Canada vs United States

	Canada (MYW corporate)				United States (Moody's (B54412))			
	1971	1972	1973	1974	1971	1972	1973	1974
Jan.	8.19	8.24	8.18	8.98	7.39	7.37	7.33	8.01
Feb.	8.30	8.21	8.20	8.98	7.25	7.35	7.35	8.03
Mar.	8.37	8.24	8.22	9.26	7.42	7.36	7.49	8.22
Apr.	8.43	8.28	8.30	9.91	7.46	7.48	7.40	8.44
May	8.47	8.30	8.40	10.12	7.77	7.37	7.45	8.59
June	8.52	8.34	8.40	10.45	7.83	7.37	7.51	8.80
July	8.56	8.34	8.51	10.81	7.87	7.41	7.65	9.07
Aug.	8.41	8.39	8.71	11.02	7.76	7.33	7.97	9.26
Sept.	8.32	8.46	8.62	10.99	7.62	7.37	7.84	9.57
Oct.	8.21	8.41	8.62	10.40	7.50	7.35	7.79	9.44
Nov.	8.14	8.25	8.71	10.34	7.49	7.22	7.82	9.27
Dec.	8.24	8.15	8.81	10.72	7.38	7.25	7.87	9.24
Avge.	8.35	8.30	8.47	10.17	7.56	7.35	7.62	8.82

Source: *Canadian Statistical Review*

and the MYW index in Canada and for the somewhat higher flotation costs incurred in Canada, we estimate the typical costs of borrowing for Canadian manufacturers to be 12 per cent, while that for their US counterparts is 9 per cent. These estimates are intended to reflect 1973-4 conditions.

Equity costs are not so easily estimated, because common shares have no maturity date and dividends are uncertain. Market prices of stocks reflect earnings and dividend expectations as well as ex ante yield requirements. There is general agreement that under certain simplifying assumptions annual equity costs k_e may be expressed as

$$k_e = \frac{D}{P} + g, \tag{3}$$

where D is the expected dividend in the current year, P is the current market price, and g is the expected annual growth rate in dividends per share. For the derivation of this expression see Gordon and Shapiro (1956) and Quirin (1967, chap. 5) or any standard contemporary textbook on business finance. k_e is of course directly dependent on the level of risk attached to the common shares of the firm in question and will be the same for companies of equivalent risk. Its level is also influenced by expectations of inflation; the relationship is usually specified, following Fisher (1930), as follows:

$$(1 + k_e) = (1 + k_r)(1 + i), \quad (4)$$

where k_r is the required real yield and i the expected inflation rate.

There is a relative dearth of information about k_e values. No time series are published, and, since g is not a directly observable magnitude but must be individually estimated for each observation, there are no time series from which it may easily be derived. However, it is used in setting the 'fair rate of return' in the public utility regulatory process. As a consequence, the judgments of regulatory tribunals provide occasional observations which represent informed estimates of k_e for a few companies. These are generally companies clustered at the extreme low-risk end of the spectrum. The typical independent manufacturer of small to medium scale is significantly more risky, and estimating k_e for companies in this class requires application of an adjustment for risk. Our estimate, derived from utility cost of capital estimates, is that cost of equity funds (net of tax) for manufacturers in 1974-5 were in the order of 18 per cent in the United States and 23 per cent in Canada. The methodology of the risk adjustment is described in Quirin and Kalymon (1977), where it is applied to a determination of equity costs for oil producers as of 1976.²

These figures may appear high. Indeed they are, in relation to historical levels, just as interest rates in the same period were at or near their historic highs. There is a propensity to identify equity costs with rates of return earned on equity investment. While earnings in the long run must rise to cover costs if capital is to be attracted, there is no necessary correspondence in the short run. Rates of return earned in companies of the risk class specified were in the 14-17 per cent range in 1974-5 with some outliers, but typical companies were selling well below book value, suggesting that expected earnings were well below the cost of capital. The inflationary component in equity costs in 1974-5 is of major proportions: implied real costs were probably of the order of 10 and 15 per cent in the United States and Canada respectively. We have, however, used the actuals in this study.

Allowing for 30 per cent debt in the capital structure, at costs of 12 per cent and 9 per cent respectively, average costs for firms in this category appear as follows:

2 The Quirin/Kalymon oil producers estimate is 21.5 per cent as of late 1976, compared with the 23 per cent for manufacturers presented here. The former was stated to be deliberately conservative, the latter is, it is hoped, unbiased; 1974-5 represented a peak in capital costs, with some decline noted in 1976.

34 Fiscal transfer pricing in multinational corporations

	United States (%)	Canada (%)
Equity (70%)	12.6	16.1
Debt (30%)	2.7	3.6
Total	15.3	19.7

These have been rounded to 15 and 20 per cent for purposes of our calculations. Assuming an average life of fifteen years, the annual costs of operating a plant costing \$1,000 in the United States can be found by calculating the annuity which at 15 and 20 per cent has a present value equal to the plant costs of \$1,000 and \$1,150. These amounts are

Annual cost - US	\$171.02
Annual cost - Canada	\$245.96
Ratio Canada/US	1.44

There is no natural unit corresponding to the man-hour in which capital inputs may be measured, since capital assets differ enormously in cost and characteristics.

Because there is not, we have constructed an artificially contrived unit defined as a dollar's worth of capital services in the United States. The same unit in Canada costs \$1.44.

To place money costs payable in two currencies on a comparable basis, it is necessary to specify an exchange rate. For purposes of this chapter, exchange rate parity is assumed. While trade is in the long run determined by comparative costs, actual transactions take place at current prices in given currencies. In the absence of trade barriers, production of commodities will be localized in those countries which can produce them most cheaply. If a product costs \$1.00 Canadian in Canada and the Canadian dollar is worth \$0.95 US, its price in terms of US funds will be \$0.95. The cost in US funds will of course change, and the direction of trade may change, if the exchange rate is altered. In a two-country world the exchange rate must be such that at least some productive activities will be located in each country. The alternative, a rate which makes *every* productive process in country A cheaper than in country B, in which A has an absolute advantage in all goods, is impossible to maintain because there would be no productive economic activity in B whatsoever. Its currency would be overvalued, and its exchange rate would have to fall far enough to permit it to produce some goods for domestic production and for export to pay for those goods it continued to import. Alternatively, relative factor prices at least one of the countries must change until B has an advantage in at least one good. The use of exchange

TABLE 2
Least-cost solutions for various processes (\$ per unit)

<i>a</i>	Canada	United States
0.1	4.55*	5.18
0.2	4.96*	5.36
0.3	5.17*	5.18
0.4	4.93	4.77*
0.5	4.57	4.17*
0.6	4.08	3.53*
0.7	3.50	2.86*
0.8	2.86	2.21*
0.9	2.19	1.61*
Total	36.81	34.87

NOTE: Asterisk denotes cheapest source. Total cost with international specialization is \$33.73.

rate parity in the examples in this chapter is not intended to imply that US - Canadian dollar parity is normal or equilibrium value or ideal in any sense. It is merely a convenient assumption adopted to keep the computations simple.

Given the production functions, the input costs, and the exchange rate, it is possible to specify unit costs for each of the processes. These appear in Table 2. Under the assumptions we have made, processes 1, 2, and 3 can be carried out more cheaply in Canada, while those with *a* values of 0.4 or greater can be carried out more cheaply in the United States. This difference in costs is due to the fact that capital is the more expensive input in Canada, labour the more expensive in the United States. Canada has a cost advantage in the labour-intensive industries, the United States in the capital-intensive ones.

It is quite possible to carry out all of the processes in either country. Costs of doing so are shown in Table 2 to be \$36.81 in Canada, \$34.87 in the United States. However, self-sufficiency does not pay for either country, since a solution in which the first three processes listed are carried out in Canada and the remainder are carried out in the United States will permit the product to be obtained in either country for \$33.73.

FREE TRADE - NO TAXES OR TARIFFS

The free trade case is not of particular interest in itself but is examined briefly here as a benchmark. For the sake of concreteness, we assume a market for 1,000 units weekly in Canada, and for 10,000 in the United States, unaffected

by price. With free trade and independent companies, production will be completely specialized, and Canada will produce 11,000 units of output in processes 1, 2, and 3, while the United States will produce 11,000 units of output from processes 4 to 9 inclusive.

Total revenues accruing to Canadian producers will be \$159,380, divided between labour and capital as follows:

Process	Units	Price	Revenues	Capital share	Labour share
1	11,000	4.55	50,050	5,005	45,045
2	11,000	4.96	53,560	10,712	47,848
3	11,000	5.07	55,770	16,731	39,039
			159,380	32,448	126,932

Labour's share in this output is 79 per cent. At \$3.62 per hour, 35,064 man-hours of employment are provided. Value of output per man-hour is \$4.55.

United States producers on the other hand receive \$209,150, which is shared between labour and capital in the following manner:

Process	Units	Price	Revenues	Capital share	Labour share
4	11,000	4.77	52,470	20,988	31,482
5	11,000	4.18	45,980	22,990	22,990
6	11,000	3.53	38,830	23,298	15,532
7	11,000	2.86	31,460	22,422	9,038
8	11,000	2.21	24,310	19,448	4,862
9	11,000	1.61	16,100	14,490	1,610
			209,150	123,636	85,514

Labour's share in the United States is only 41 per cent. Only 19,613 hours of employment are provided, but output per man-hour is \$10.66.

It should be noted that these differences in 'productivity' as measured by output per man-hour do not result from any intrinsic difference in the productive capacity of Canadian labour, which is, by assumption, a perfect substitute for US labour. Indeed, 19,613 man-hours of Canadian labour would produce the identical physical output if combined with the capital equipment used by US workers. The differential results entirely from the US concentration in capital-intensive industries. Nor does the higher share going to labour in Canada, 79 per cent as against 41 per cent in the United States, result from more equitable approach to the division of income. It is simply the consequence of the concentration on labour-intensive industries. The wage rate in Canada is in fact lower.

If the assumption that production is carried out by independent companies is altered, and a multinational substituted, nothing happens. The multinational will

also find it cheaper to serve its market by concentrating processes 1 to 3 in Canada and 4 to 9 in the United States and will do so as long as prospective competition forces it to be efficient.

A CANADIAN TARIFF – INDEPENDENT PRODUCERS

Now assume that a 20 per cent ad valorem import duty is imposed on imports of any constituent parts of our product into Canada, while no tariff is imposed by the United States. Landed costs of components from processes 4 to 7 in Canada in comparison with the costs of producing in Canada, are increased as follows:

Process	US price before duty	US price with duty	Canadian cost
4	4.77	5.72	4.93*
5	4.17	5.00	4.57*
6	3.53	4.24	4.08*
7	2.86	3.43*	3.50
8	2.21	2.65*	2.86
9	1.61	1.93*	2.19

An asterisk denotes the cheapest source for a Canadian producer.

Because of the tariff it is cheaper for producers to obtain components 4 to 6 in Canada to serve the Canadian market, although these components will still be obtained for the US market from US sources. The tariff is not high enough to shift all processes into Canada, and Canadian requirements of components 7 to 9 will still be met by imports. Both markets will continue to be supplied with components 1 to 3 from Canadian sources. One effect is to increase the cost to the Canadian consumer from \$33.73 to \$36.01. Another effect is to increase the size of the Canadian industry, which will now receive \$172,960:

Process	Units	Price	Revenues	Capital share	Labour share
1-3	as before		159,380	32,448	126,932
4	1,000	4.93	4,390	1,972	2,958
5	1,000	4.57	4,570	2,285	2,285
6	1,000	4.08	4,080	2,448	1,632
			172,960	39,153	133,807

Employment rises to 36,963 man-hours, ‘productivity’ per man-hour to \$4.68; labour’s share in the industry’s income drops to 77 per cent.

There is a corresponding loss in employment in the United States, a further increase in computed US productivity as remaining employment is concentrated

in the more capital-intensive industries, and an increase in the share of income accruing to labour in the United States.³

A CANADIAN TARIFF – MULTINATIONAL PRODUCTION

Now assume that the formerly independent Canadian manufacturers are absorbed by a multinational, whether Canadian, American, or third-country in origin, which also absorbs the US producers. If it retains the production pattern of its independent predecessors, the Canadian price will remain at \$36.01, which is the price prospective competitors can meet. However, it could produce the product for \$33.73 if it shifted the output of components 4 to 6 back to the United States. The current price of \$36.01 is comprised as follows:

Components	Source	Production cost (\$)	Duty (\$)	Total (\$)
1-3	Canada	14.58	–	14.58
4-6	Canada	13.42	–	13.42
7-9	United States	<u>6.68</u>	<u>1.33</u>	<u>8.01</u>
Total		34.68	1.33	36.01

Shifting output to the United States would, if previous valuations were used, cost

Components	Source	Production cost (\$)	Duty (\$)	Total (\$)
1-3	Canada	14.58	–	14.58
4-6	United States	12.47	2.49	14.96
7-9	United States	<u>6.68</u>	<u>1.33</u>	<u>8.01</u>
Total		33.73	3.82	37.55

This clearly would not pay. However, there is now no open market against which to compare component prices moving across the border, and if the duty payable on the imports from the United States which have an economic cost of \$19.15 can be reduced from the calculated level of \$3.82 to not more than \$2.61 (\$36.01 – 33.73 + 1.33) it will be at least as profitable to produce items 4 to 7 in the United States. Transfer price manipulation offers just such an opportunity.

3 It should be noted that, given the assumed Cobb-Douglas production functions, the shares of labour and capital are given by the coefficients 1-*a* and *a* respectively and are independent of absolute or relative factor prices. The changes in income distribution within Canada and the United States in this and the following examples is due entirely to the reallocation of processes between the two countries.

If no constraints on the transfer price were adopted, the ‘ideal’ transfer price would be zero, which would avoid duty on items 4 to 9 altogether and enable the company to pocket the \$2.28 saving resulting from producing at \$33.73 and selling at \$36.01.

Adoption of a zero transfer price would completely negate the effect of the tariff. United States production and employment would be identical to that attained in the free-trade situation, as would Canadian. There would be no tariff revenue for the Canadian government. If there were no constraints on multinational competitors adopting the same strategy, there might not even be the price increase from \$33.73 to \$36.01.

If only from a desire to protect its revenue, no government levying customs duties is prepared to accept zero valuations on dutiable imports. Under a ‘fair market value’ rule, however, it may accept, in the absence of evidence on arm’s-length transactions (which do not exist in the situations postulated), valuations computed from accounting costs plus arbitrary profit margin or sales receipts minus costs of domestic inputs. If a ‘cost’ rule is applied, component 9, which would cost \$2.19 to produce in Canada, is imported despite the tariff because its US cost of \$1.61 plus duty of \$0.32 is less than the Canadian cost. We can compute discounts from US costs needed to be competitive with Canadian costs after paying 20 per cent duty in the following manner: First, compute the US-Canadian cost differential, which is the net saving resulting from production of the component in the United States. As long as the total tariff payable is less than this amount, it will still pay to import the component into Canada. Second, since the tariff is at a rate of 20 per cent, the valuation applied must not exceed five times the cost differential.

Component	Canadian cost (\$)	US cost (\$)	Available for duty (\$)	Maximum dutiable value (\$)	Discount required (%)
9	2.19	1.61	0.58	2.90	none
8	2.86	2.21	0.65	3.25	none
7	3.50	2.86	0.64	3.20	none
6	4.08	3.53	0.55	2.75	25
5	4.57	4.17	0.40	2.00	56
4	4.93	4.77	0.16	0.80	83

Neither the 83 per cent discount required for component 4 nor the 56 per cent discount required for component 5 is likely to be a realistic possibility. However, a 25 per cent discount may well be attainable and would permit shifting process 6 to a US location, producing the following costs:

Component	Source	Production cost (\$)	Valuation (\$)	Duty (\$)	Total (%)
1-3	Canada	14.58		-	14.58
4	Canada	4.93		-	4.93
5	Canada	4.57		-	4.57
6	US	3.53	2.64	0.53	4.06
7	US	2.86	2.15	0.43	3.29
8	US	2.21	1.66	0.33	2.54
9	US	<u>1.61</u>	<u>1.21</u>	<u>0.24</u>	<u>1.85</u>
		34.29		1.53	35.82

This alternative therefore offers a cost saving below the \$36.01 figure established earlier. If it is adopted, there will be ‘slippage’ back toward the free trade solution; less production will be located in Canada, there will be less employment in Canada, and lower tariff revenues will result than if independent producers were involved. Multinational organizations have a comparative advantage over independent national producers based on nothing more than their ability to manipulate transfer prices.

Ability to adopt the alternative in the example given is contingent, of course, on the firm’s ability to ship the product to its affiliate at a transfer price that is 25 per cent less than economic cost. This in turn is dependent on its ability to persuade customs authorities that the price, established in a context where no objective standard of fair market value exists, is a suitable valuation. Accounting costs of the four products in question include a labour component of \$2.87 and will include the depreciation and interest components of the total capital return of \$7.34. These will be approximately $\frac{2}{3}$ or \$5.34, for a total accounting cost of \$8.21, against the valuation of \$7.66. The valuation would probably not be accepted because costs are not covered. Usual valuation procedures would require a profit margin in addition to the covering of costs. Opportunities to exploit transfer pricing are restricted by valuation rules even when fair market value evidence is not available but are not eliminated.

CORPORATE INCOME TAXES IN THE FREE TRADE CASE

The introduction of corporate income taxes has somewhat more complex effects than tariffs. The corporate income tax is a tax on the use of capital in a particular legal form, as corporate equity. While changes in corporate tax rates may in the short run have some impact on shareholders’ earnings, the supply price of funds in corporate equity form will in the long run be dominated by the rates of return available on other investments not subject to the tax, that is, corporate and other bonds, mortgages, insurance policies, real estate, and ownership interests in unincorporated businesses. Where such a tax is imposed, capital can be attracted to the corporate sector only if rates of return before tax rise to levels

which provide for the payment of taxes and for after-tax rates of return equivalent, on a risk-adjusted basis, to those obtainable on alternative investments, that is, on everything but corporate equities.

The imposition of such a tax, if not anticipated, will result in an immediate drop in share prices, reflecting the incidence of the tax on the anticipated earnings stream, such that equity yields remain equivalent to those on the other assets unaffected by the tax. k_e is increased as a result of the fall in share prices, and investments undertaken subsequent to the price decline must earn the new value of k_e . The initial burden falls on those who are shareholders at the time the tax is introduced, but for all investments undertaken subsequent to the imposition of the tax, shifting will occur. To the extent that the product markets or other factor markets do not permit shifting, there may be a diminished demand for funds from the corporate sector, a resultant drop in the demand for loanable funds, and a decline in yields generally and some substitution of consumption for saving. In the long run, however, most if not all of the tax will be shifted either forward into product prices or backward via a reduction in economic rents earned by specialized resources (such as mineral lands or forests). In the typical manufacturing case the shifting will be forward. Our review of this literature suggests that there is strong evidence of significant shifting, even in the short run,⁴ and that in the long run shifting is virtually complete. There is a theoretical possibility, noted above, that investors seeking to avoid the tax would shift enough funds out of corporate equities into other assets to drive down rates of return elsewhere, so that part of the burden is borne by suppliers of funds and is not shifted. In view of the relative volumes of outstanding corporate equities and other real and financial substitutes, we believe this effect to be small enough to ignore. Also ignored is the minor cost of capital change consequent upon tax-induced shifts in corporate capital structures.

However, the effect is not simple. Where such taxes are imposed, capital costs are raised to the extent that they incorporate an equity cost component. Interest and depreciation components, which are deductible for tax purposes, are of course unaffected. For purposes of our illustration, we have assumed an effective corporate income tax rate of 52 per cent in Canada and 48 per cent in the United States. The first effect of this is to increase capital costs in both countries. The unit cost of capital is increased as follows:⁵

- 4 The notion that corporate taxes are shifted is not universally accepted by economists. However, most of the debate has been over the extent of short-run shifting, not over the long-run shifting assumed here. The literature is well reviewed in Lévesque (1967), which concludes that a large fraction is shifted even in the short run.
- 5 The annuity cost defined above incorporates a depreciation component and a return component which includes an interest component and a profit component. It is the latter which must be grossed-up to cover taxes.

	<u>United States</u>	<u>Canada</u>
Cost without taxes	1.00	1.44
Taxes on equity return	0.46	0.88
Cost with taxes	1.46	2.32

It will be noted that the capital cost disadvantage of Canadian producers vis-à-vis their US competitors is magnified as a consequence of the tax. Part of the magnification is due to the higher Canadian tax rate, but a magnification of the absolute cost disadvantage would take place even if tax rates were identical because capital costs are higher in Canada to begin with. Labour costs, of course, are unaffected.

Because capital costs more, the optimum choice of technique is altered in both countries, with less capital and more labour being employed than in the no-tax case. Least-cost combinations are different. Table 3 shows the new set of least-cost solutions for the two countries. The changes in cost between Table 2 and Table 3 represent the net effect of the tax and can be conceived of as the algebraic sum of two effects, the gross tax effect which would take place if technological choice were unaffected, minus the saving in tax resulting from substituting an untaxed input (labour) for the taxed input (capital). While costs are increased in both countries, the increases in Canadian costs exceed the increases in US costs because of the magnification effect noted above. As a consequence, process 3, which could be carried out more cheaply in Canada in the no-tax free trade case, can now be carried out more cheaply in the United States.

With free trade, independent companies in Canada will specialize in processes 1 and 2, while US companies will operate all other processes. The revenue breakdown for the Canadian industry will be as follows:

<u>Process</u>	<u>Units</u>	<u>Price</u>	<u>Revenues</u>	<u>Capital share</u>	<u>Labour share</u>
1	11,000	4.77	52,470	5,247	47,223
2	11,000	5.47	60,170	12,034	48,136
			112,640	17,281	95,359

In this table the capital share includes taxes of \$6,538. Labour's share is 84.6 per cent and 26,342 man-hours of employment are provided. Output per man hour is \$4.27. With other things unchanged, the effect of introducing corporate income taxes in both countries in this scenario is to shift production and employment from Canada to the United States, to increase labour's share in Canadian GNP, and to reduce output per man-hour in Canada.

What can a multinational achieve in this context? Obviously the specialized solution obtainable by the independent firms provides a starting point. However,

TABLE 3
Least cost solutions with corporate taxes – independent case (\$ per unit)

<i>a</i>	Canada	United States
0.1	4.77*	5.39
0.2	5.47*	5.78
0.3	5.86	5.80*
0.4	5.97	5.54*
0.5	5.79	5.05*
0.6	5.43	4.43*
0.7	4.88	3.72*
0.8	4.19	3.00*
0.9	3.36	2.25*
Total	45.82	40.95

NOTE: Asterisk denotes cheapest source. Total cost with international specialization is \$40.02.

the costs assigned to the inputs in this case have two components: first, the resource costs, which must be paid to suppliers of inputs, which are the same as in the no-tax case; second, tax costs, which are dependent on prices charged and are subject to a degree of manipulation. By reducing the transfer price, taxable income is reduced in one country and increased in the other. Where differences in tax rates exist, total tax liability and hence total costs may be reduced. Consider the effect of substituting Canadian production for US production in process 3, which is the marginal process shifted to the United States in the independent company case. If priced on a total cost basis, including taxes, the Canadian output costs \$5.86, compared with the US cost of \$5.80.

These total costs, if covered, generate the following:

	United States	Canada
Total revenue	5.80	5.86
Wages	4.06	4.10
Return on capital	1.74	1.76
Interest and depreciation	0.59	0.48
Profit before tax	1.15	1.28
Tax	0.55	0.67
Net profit	0.60	0.61

If production is shifted to Canada, with a transfer price set to cover wages, interest, and depreciation, and the required profit taken in the United States instead of in Canada, tax liability can be reduced and a lower total cost of \$5.75 obtained:

	United States	Canada
Total revenue	5.75	4.58
Purchases	4.58	-
Wages	-	4.10
Return on capital	-	0.48
Interest and depreciation	-	0.48
Profit before tax	1.17	-
Tax	0.56	-
Net profit	0.61	-

This solution reduces the total cost to be borne by customers and shifts production and employment back to Canada. There is no tax loss to the Canadian treasury because, in the absence of transfer pricing, production would shift to the United States. Nor is there any loss to the US treasury. There is a reduction in employment in the United States, but the saving results from substituting, in effect, Canadian labour for US capital.

In this instance the availability of transfer pricing serves to correct at least partially the distortion in geographic production pattern brought about by the tax. It does not, however, eliminate the fiscally induced inefficiency brought about by the adoption of lower capital/labour ratios in both countries.

CONCLUSIONS

We have examined a simple transfer pricing model in which the opportunity for transfer pricing is created by the existence of a tariff. With the given cost conditions and production functions drawn from the Cobb-Douglas family, a 20 per cent tariff increases the range within which Canadian production is economic, at least for domestic markets, from capital-coefficient (α) values of 0.1 to 0.3 without the tariff to 0.1 to 0.6 with the tariffs.

Transfer pricing erodes the effect of the tariff; with a sufficiently low transfer price its effect can be completely negated. Valuation rules which restrict freedom to set transfer prices are a necessity if the intent of any given import duty is to be achieved.

Effects of transfer pricing opportunities created by corporate income tax differences were also examined. Present corporate taxes tend to shift production to the United States as well as to induce less capital-intensive technologies in both countries. This effect occurs because the tax, which is a tax on using capital, intensifies the existing capital cost disadvantage of Canadian producers. The model indicates that the existence of transfer pricing opportunities can reduce the locational distortions induced by corporate income taxes.

The precise degrees of production shifting and erosion under specific valuation rules cannot be determined with precision within the framework of numerical examples but requires explicit mathematical analysis. The results of such analyses appear in the next chapter.

ECONOMIES OF SCALE

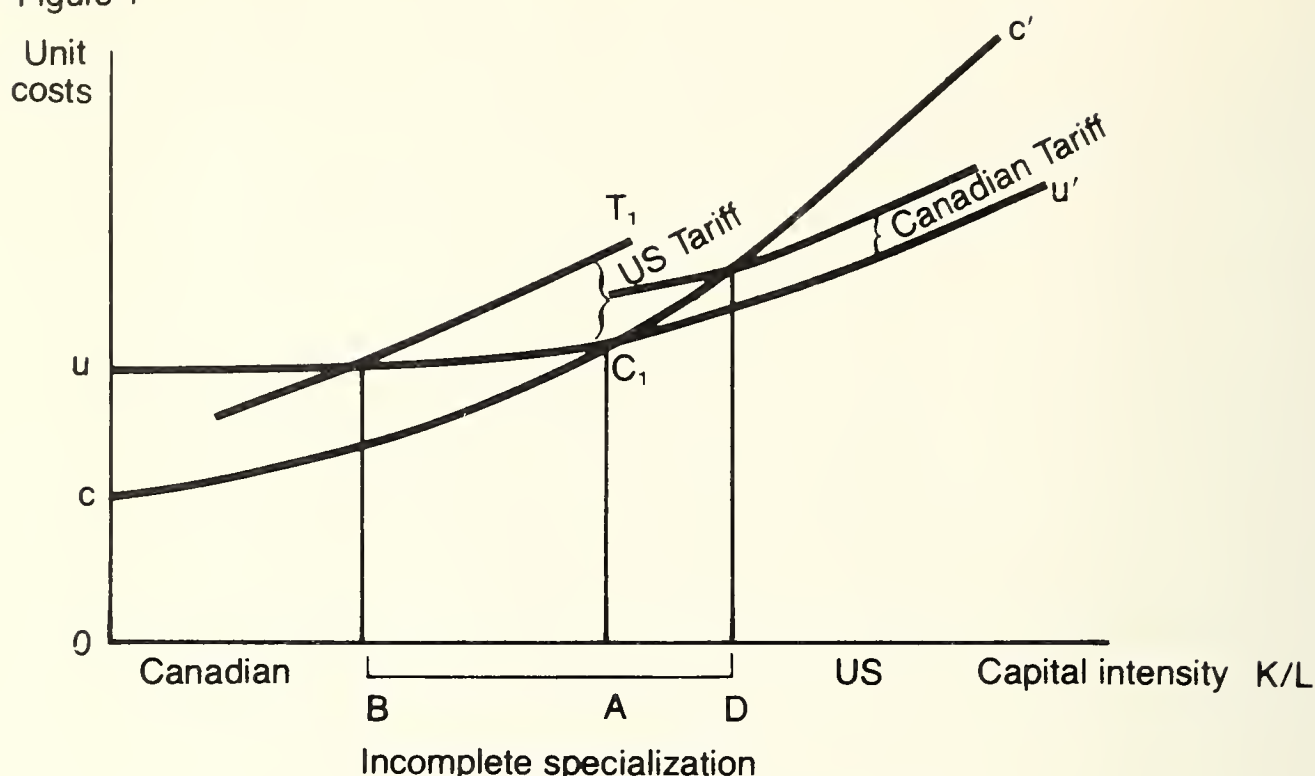
The case examined above is one in which the underlying production functions exhibit constant returns to scale. The production processes characterized by such production functions are those in which larger outputs are obtained by multiplication of similar facilities, whether by a larger number of machines in a given plant or by a multiplicity of similar plants. There is some considerable evidence that, at least over certain output ranges, many manufacturing processes are characterized by increasing, rather than constant returns to scale. Larger output may be realized by using a single large machine or process unit which produces, say, twice the output, but at less than twice the cost. Alternatively, in a multiproduct operation such economies may be realized when larger outputs permit equipment to be used continuously for a single product, eliminating the 'down time' needed to change from one product to another. Daly et al. (1968) have identified such diseconomies due to short production runs as a major contributing factor in the relatively poor productivity performance of many Canadian manufacturing industries.

The major identifiable economies of scale operate at the level of the firm. Persistent economies of scale over the entire output range are incompatible with competition and create natural monopoly situations in which the largest firm will ultimately eliminate all competitors. The available evidence on industry structure suggests that even if economies of scale exist at the production or plant level they are typically offset by administrative or marketing diseconomies at some point, since the typical structural pattern in manufacturing industries is one in which several competitors coexist. The natural monopoly outcome is observed, by and large, only in public utilities and transportation.

Our concern here, however, is not with the extent to which economies of scale are characteristic of manufacturing industries, but with whether their presence makes any difference as far as the propensity to use or ability to exploit transfer prices is concerned.

In the two-country free trade model, the basic starting point of our analysis, the locational pattern which emerges is one of complete specialization, dependent on relative factor costs and the capital intensity of the individual production processes involved. This is demonstrated for the constant-returns-to-scale

Figure 1



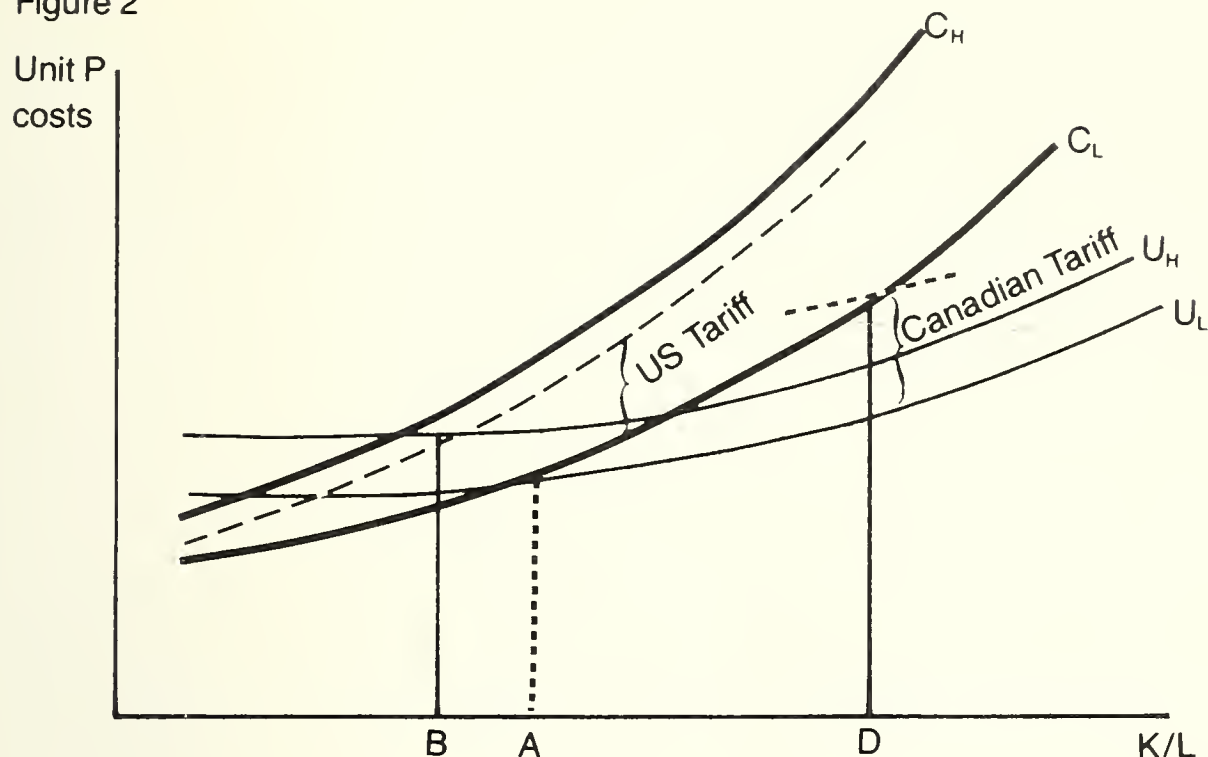
case above. It is clear that the same pattern will emerge in an increasing returns situation; since the entire output will continue to be produced where it is cheapest to do so.

Economies of scale will, however, have an impact on the partial specialization pattern which emerges when tariff barriers are introduced, particularly when different-sized markets are located on opposite sides of the barrier as they are in the Canadian-US case. A US tariff will shift a larger proportion of the processes to the United States than it would in the constant-returns case, since the cost inefficiency induced by the tariff will be offset, in the domestic US market, by the effect of economies of scale. The extent of the countervailing shift introduced by a given Canadian tariff, however, will be reduced because economies of scale at the margin will permit US producers to overcome the tariff and any factor-cost disadvantage.

These effects may be ultimated diagrammatically. In Figure 1, which represents the constant-returns case, the capital intensity of the process is measured on the horizontal axis, unit cost on the vertical. CC' and UU' show Canadian and US unit costs for the spectrum of production processes.⁶ Under free trade there is complete specialization, with Canadian firms operating processes in the range OA . With a US tariff of C_1T_1 , the range of Canadian specialization is reduced to OB , and a range of partial specialization BA is created; US specialization continues in the range beyond A . If a Canadian tariff is introduced the range of partial

6 A unit of output is defined as the amount produced by one unit of labour in the United States, hence the curves have a steeper slope in Canada than in the United States.

Figure 2



specialization is extended to BD , with Canadian specialization continuing over the range OA and US specialization beyond D .

When economies of scale are present the effect is to create different cost curves relating to low-volume (domestic market only) operation and high-volume (combined markets) respectively. This is depicted in Figure 2. The curves labelled C_H and C_L reflect Canadian costs for domestic and combined markets respectively. U_H and U_L reflect US costs for domestic and combined markets respectively. OA , as before, is the free trade solution. A US tariff on C_L reduces the range of Canadian specialization to OB ; a Canadian tariff on U_L restricts the range of US specialization to the right of D . Between B and D partial specialization applies.

The exact effect depends on what happens to the slope of the curves as scale is changed.

The nature of the opportunities presented for transfer price manipulation is similar with increasing returns to scale. There is, however, one important difference. With constant returns, manipulation paid if the tax or combined tax-tariff saving was enough to offset the real cost disadvantage. With increasing returns, the cost difference to be offset is the difference in marginal costs between producing in the two locations, since marginal costs are below average costs rather than equal to them as with constant returns. There is thus a possibility that transfers may take place at prices below marginal costs.

The introduction of the increasing-returns situation raises several problems, which stem from the fact that marginal costs are then less than average costs. If there were separate producers on both sides of the border, both would have to

have monopoly power in their domestic markets to maintain a domestic price sufficiently in excess of marginal cost to cover average costs and remain solvent. Under unfettered free trade there would still be specialization, with international prices equal to or greater than marginal costs, depending on the bilateral monopoly outcome, which is generally conceded to be to some degree indeterminate and dependent on bargaining power and skill. To the extent that departures from marginal cost pricing on international transactions imposed inefficiency costs on one or both parties, there would be a potential gain in replacing the two independent national companies with a multinational which could transfer internally at marginal cost. In economic terms this would be an efficient solution at the production level; presumably the domestic monopoly power of the local units would remain unchanged. We would therefore propose to measure transfer pricing distortion as a departure from marginal cost pricing. While it is clear that the incentive to arrange transfer prices to avoid tax or tariff liabilities to the extent that marginal cost differences permit remains the same with increasing returns as with a constant cost base, and that it may conceivably lead to transfers below marginal cost, this overlooks the legislative and regulatory framework within which such trade takes place.

The point of departure of trade regulation and valuation procedures is not marginal cost but average cost. Sales by an independent monopolist to a foreign counterpart at prices less than the domestic level, which as we have seen is a likely outcome in the decreasing-cost case, constitute dumping and may attract anti-dumping duties. It is probable that the likelihood of attracting such duties can be reduced if such sales are internalized within a multinational, but this is far from clear. The pertinent valuation rules applicable to non-arm's-length sales are also framed in terms of average costs or equivalent profit margins, so that the ability of multinationals to get transfer prices down to the marginal cost level, let alone below it, must be doubted. While average-cost transfer prices must be regarded as a distortion from the free trade situation, it has its counterpart in domestic monopoly prices and is due as much to the monopolistic domestic market structure as to the existence of transfer pricing opportunities.

While transfer pricing opportunities open to firms with significant scale economies are similar in kind to those possessed by firms in competitive industries, such opportunities are merely one of the problems created by the monopolistic or oligopolistic structure which such cost structures engender. Valuation rules based on average-cost concepts are apt to be more restrictive for such firms than for firms in constant-returns industries, since the natural propensity of the former is to trade at marginal cost and below average cost.

Structural evidence suggests that extreme scale economies, persistent enough to create pure monopoly situations, are rare, that the more usual market structure is one in which several competitors remain.

5

A more general analysis of the two-country case

The model developed in chapter 4 provides a number of useful insights into the circumstances giving rise to transfer price manipulation and into the mechanics of adjustment to alternative tax or tariff regimes and the transfer price manipulation they induce. The production relationships postulated were chosen to illustrate these phenomena explicitly. Thus they involve very restrictive assumptions, chosen for expositional reasons and not necessarily because of any close resemblance to the world of economic reality.

Our objective is to explore, quantitatively, worlds of empirical relevance. To do so with reasonable efficiency we must relax the restrictive assumptions of the last chapter and develop a more general model. We have retained the concept of a flow from earlier production stages to later stages, because this is characteristic of most industrial processes with which we are familiar. Indeed, we have made this assumption explicit by postulating an intermediate product stage as well as a final output stage. The earlier model required no such sequential ordering of inputs.

In the earlier model a finite number of stages were identified, each with its own technology. Substitution between outputs of these stages was ruled out by assumption, and substitution of production from one geographic source or another took place in discrete jumps as stages were shifted from one country to the other. This assumption of 'fixed coefficients' in the over-all production function is extremely strong, and we have replaced it with an assumption of 'weak separability' in which there are only two stages. In the first, labour and capital co-operate to produce an intermediate product. In the second, output from the first stage is combined with additional labour and capital to create the final product. Instead of assuming that the intermediate product enters the final product in a fixed proportion, we assume that it is a partial substitute for labour and capital applied in the final stage. In effect, the boundary between the intermedi-

ate output and the final output is made movable, permitting continuous rather than discrete substitution and eliminating the need for a multiplicity of stages. In effect we have 'nested' production functions with the initial stage output X , given by

$$X = X(K_X, L_X), \quad (5)$$

where K_X and L_X are the capital and labour inputs applied to the production of X . The final stage output Q is given by

$$Q = Q(K_Q, L_Q, X). \quad (6)$$

Equation (6) implies nothing about separability; weak separability is introduced by assuming that the substitution at the final stage is between 'doses' of labour and capital applied at that stage and the intermediate input, so (6) becomes

$$Q = Q[I(K_Q, L_Q), X], \quad (6a)$$

where $I(K_Q, L_Q)$ defines the substitution possibilities between K_Q and L_Q ; in practice the K_Q/L_Q ratio will be chosen to be cost-minimizing, with substitution possibilities between this suboptimized (K_Q, L_Q) mix and X being subsequently considered in order to determine a least-cost means of producing Q .

Weak separability is assumed primarily because of its computational convenience and because it permits explicit cost calculations at the successive stages. Little is known about the separability properties of real-world production functions; they are usually incorporated in the model specification without specific justification. At the aggregate level, tests by Denny and May (1978) on Canadian data and Burgess (1976) on US data fail to reject or confirm the separability hypothesis. At a less aggregated level, work by Griliches and Ringstad (1971) on plant data for Norway appears to support a somewhat stronger version of separability than is assumed here, somewhat closer to that assumed in chapter 4.

The other assumption made in chapter 4 but weakened here is the premise that the individual production functions are Cobb-Douglas (CD). While the Cobb-Douglas function has been used in empirical investigations of production relationships since such investigation began, it has frequently been specified without regard to its appropriateness in comparison with alternative functional forms. It has too often been chosen for computational convenience, limited data availability, or taste. Given the relatively weak resolving power of statistical testing procedures when confronted with limited samples of 'noisy' data, it is frequently

difficult to reject it decisively in favour of alternative functional forms. Because it is highly restrictive, it displays an impressive ability to generate a large volume of conclusions with minimal inputs of fact. For this reason alone, we believe, it should be used only with caution and discretion. In the present context we prefer to use the somewhat more general constant elasticity of substitution (CES) production function, of which the (CD) function is a special case, but which has in general an additional degree of freedom.

The generalized CES production functions can be written

$$X_i = [a_X K_i^{-\rho_X} + (1 - a_X) L_i^{-\rho_X}]^{-1/\rho_X}, \quad (7)$$

$$I_i = [a_I K_i^{-\rho_I} + (1 - a_I) L_i^{-\rho_I}]^{-1/\rho_I}, \quad (8)$$

$$Q_i = [a_Q I_i^{-\rho_Q} + (1 - a_Q) X_j^{-\rho_Q}]^{-1/\rho_Q}, \quad (9)$$

in which i, j denote the location (j can equal i), K and L represent capital and labour applied, X, I are intermediate inputs, and Q is the final product. a_X, a_I , and a_Q are distribution parameters which define the respective shares of the inputs in value added, while ρ_X, ρ_I , and ρ_Q are parameters which define the substitution possibilities. The ρ 's are related to the more usual elasticity of substitution by the relationship

$$\sigma_k \equiv \frac{1}{1 + \rho_k}, \quad k = X, I, Q. \quad (10)$$

As the substitution parameter ρ approaches a limiting value of 1.0, the Cobb-Douglas production function emerges as a special case. In the Cobb-Douglas case a serves not only as a distribution parameter but also as an indicator of the relative capital intensity of the production process. Unfortunately, no such simple interpretation is available in the more general case.

In our analysis, these production functions were used, along with the unit input cost ratios developed in chapter 4, to develop cost and revenue functions for the several options, which were further modified to incorporate tax effects. Unlike the examples in chapter 4, where location of production for both markets was examined, only production for the Canadian market is considered here. Basically, the alternatives involve location of the basic and final stages in Canada or the United States and the choice of technique at each stage. Since output from the initial stage is substitutable for further labour-capital inputs at the final stage, the 'degree of manufacture' in the initial stage becomes an implicit variable as well. Thus the substitution possibilities are continuous, rather than discrete as in chapter 4. The multinational parent company is assumed to be US-based.

Least-cost solutions, in terms of supply to the Canadian market, were calculated for a variety of a and ρ values, under the following sets of assumptions:

Scenario 1: No taxes, free trade. In this case there are no incentives to practise transfer pricing, and the multinational company solution is the same as the independent producer solution

Scenario 2: No taxes, customs duties at the rate of 10 per cent on unfinished goods, 15 per cent on finished goods.

Scenario 2a: Same, but multinational firm, no constraints on transfer pricing.

Scenario 2b: Same as 2a except that value for duty is constrained by an allocated cost calculation of the type applied by Canada Customs.

Scenario 3: Free trade, corporate taxes in Canada and United States at rates of 46 and 51 per cent respectively. Independent firms.

Scenario 3a: Same but multinational firms, no constraints on transfer pricing.

Scenario 3b: As in 3, but with a foreign tax credit applicable on domestic taxes.

Scenario 3c: As in 3, but no tax credit applicable. Transfer prices constrained by a profit margin rule somewhat similar to that in the *Eli Lilly* case.

Scenario 3d: As in 3c, but with no tax credit and with transfer pricing rules constrained by a markup rule similar to that applied by Canadian tax authorities.

Scenario 4: Taxes and customs duties at the rates specified. Independent firms.

Scenario 4a: Same, multinationals with no constraints on transfer pricing.

Scenario 4b: Same, but with US foreign tax credit.

Scenario 4c: As in 4a, but with the profit margin constraint specified in Scenario 3c.

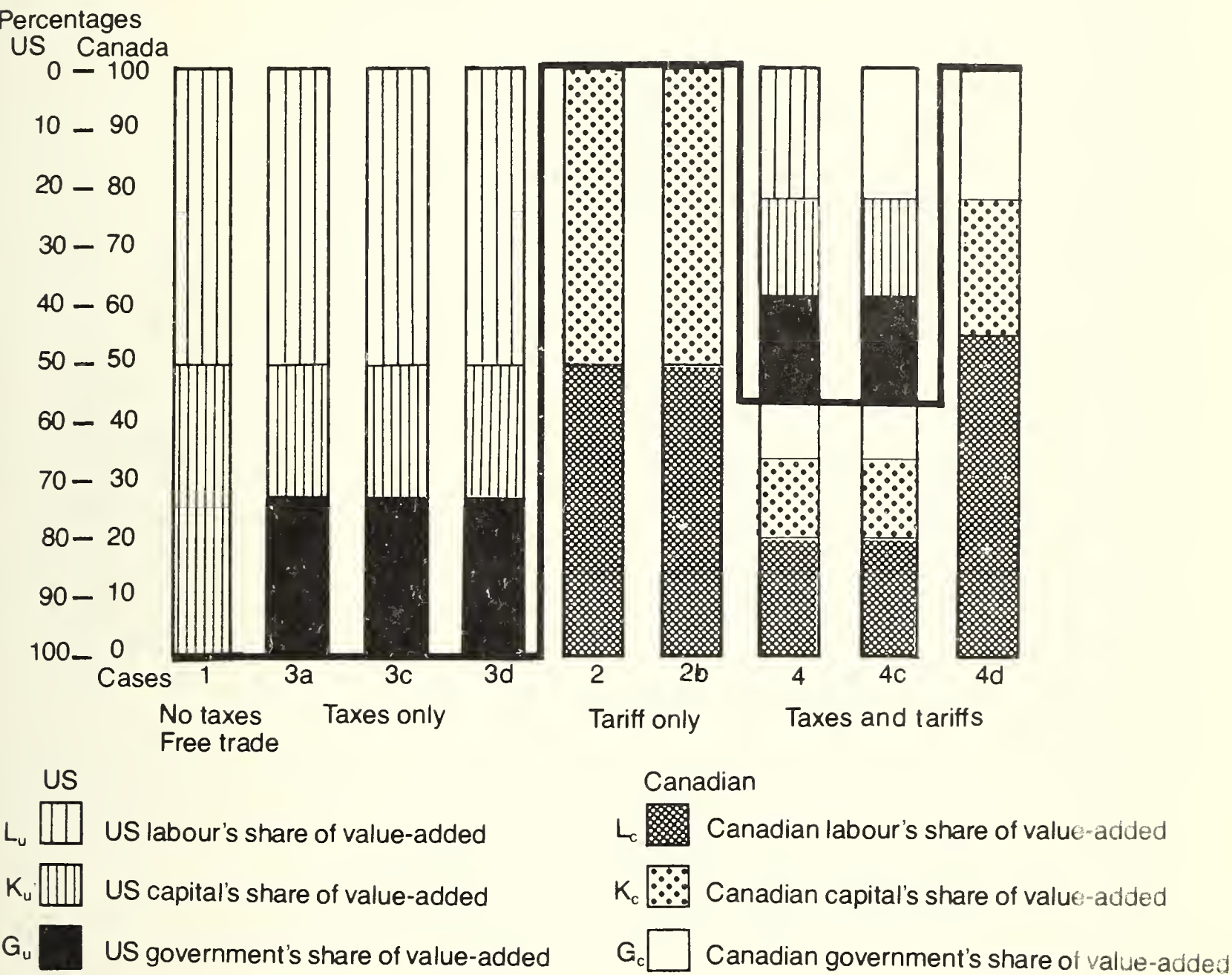
Scenario 4d: As in 4a but with cost plus markup rule as in Scenario 3d.

Alternative tax and tariff rates were also analysed; details of these and their solutions may be found in appendix B, while the actual model specification is described in more detail in appendix A. The most realistic and therefore most complex cases are those in which both taxes and tariff appear; the others are included to show the 'partial' effects of taxes or tariffs alone.

The major results of interest concern the locational implications of alternative scenarios, which can be expressed in terms of the distribution of net output or value added between the two countries, and the distribution implications, which are reflected in the division of each country's output share between labour, capital, and the tax collector.

These effects may be displayed graphically in bar-chart form, as is done in Figures 3 to 10, which illustrate nine scenarios for each of the eight of assumed production scenarios we believe most likely to be of empirical significance. Results for other cases will be found tabulated in appendix B. In Figures 3 to 10, each bar shows the distribution of output for a given tax-tariff regime. A heavy

Figure 3
Distribution of value-added, alternative tax-tariff
scenarios ($\alpha_i = 0.5, i = X, Q, I; \sigma_X = \sigma_I = 0.99, \sigma_Q = 0.01$)



line has been superimposed on the bars, reflecting the Canadian-US split. In Figure 3, as we move from the no tax-free trade case into the alternative tax-only regimes, the international distribution of output is unaffected, though government's share is increased. In the tariff-only scenarios, the protective effect takes hold, and production is shifted from the United States into Canada. In the absence of a tax, no government revenues result. For comparison see Figure 6, a scenario in which the tariff does *not* have a protective effect, in which case the Canadian government shares in the gross proceeds, which have of course been increased by the amount of the tariff. Reverting to Figure 3, regimes 4 and 4c produce a sharing of output as part of the operation is shifted into Canada. All is shifted into Canada in regime 4d.

Figure 4 is an instance in which production which would ordinarily take place in the United States is in part shifted into Canada as a result of the assumed

Figure 4**Distribution of value-added, alternative tax-tariff scenarios** $(\alpha_i = 0.5, i = X, Q, I; \sigma_X = \sigma_I = 0.99, \sigma_Q = 2.5)$

Percentages

US Canada

0 — 100

10 — 90

20 — 80

30 — 70

40 — 60

50 — 50

60 — 40

70 — 30

80 — 20

90 — 10

100 — 0

Cases

1

3a

3c

3d

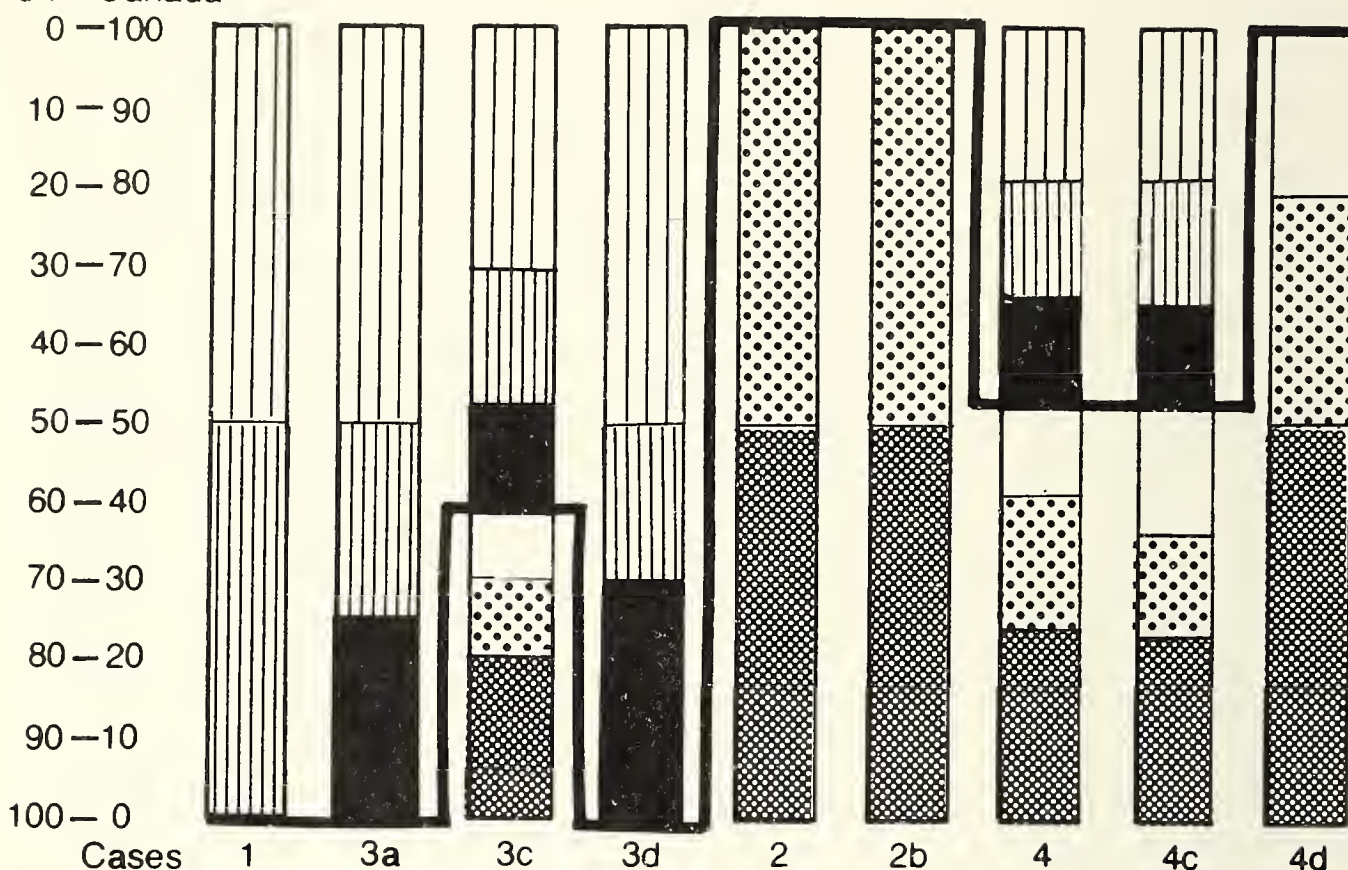
2

2b

4

4c

4d



higher US tax rate, with a profit margin rule applied. However, a cost-plus rule on transfer prices, of the type imposed by Canada, shifts it back to the United States.

In many of the production situations shown in the figures, the effect of adding tax to the tariff is to weaken the location-modifying effects of the tariff. This occurs in Figures 3, 4, 5, 7, and 8. In each of these cases, the effect of the tariff is restored by the Canadian cost-plus pricing rule, indicating its importance in preventing the erosion of intended impacts of commercial policy by foreign tax systems and its critical role in the Canadian tax system. The figures, of course, assume effective enforcement; the erosive effects which would ensue from its absence are evident from inspection of the figures.

Unfortunately it is not possible to display more than a few of our results in pictorial form. Over 25,000 cases have been analysed and are reported in appendix B. These cover a range of parameter values, in terms of both the production function parameters assumed and tax and tariff rates. While these are believed to cover the range of empirically relevant possibilities, some will obviously be of more relevance than others. Appendix B also details the capital-labour distribution in selecting Canadian manufacturing industries, which permits some evaluation with respect to the relevant distribution parameter.

Figure 5
Distribution of value-added, alternative tax-tariff scenarios
($\alpha_i = 0.5, i = X, Q, I; \sigma_X = 0.99, \sigma_I = \sigma_Q = 0.01$)

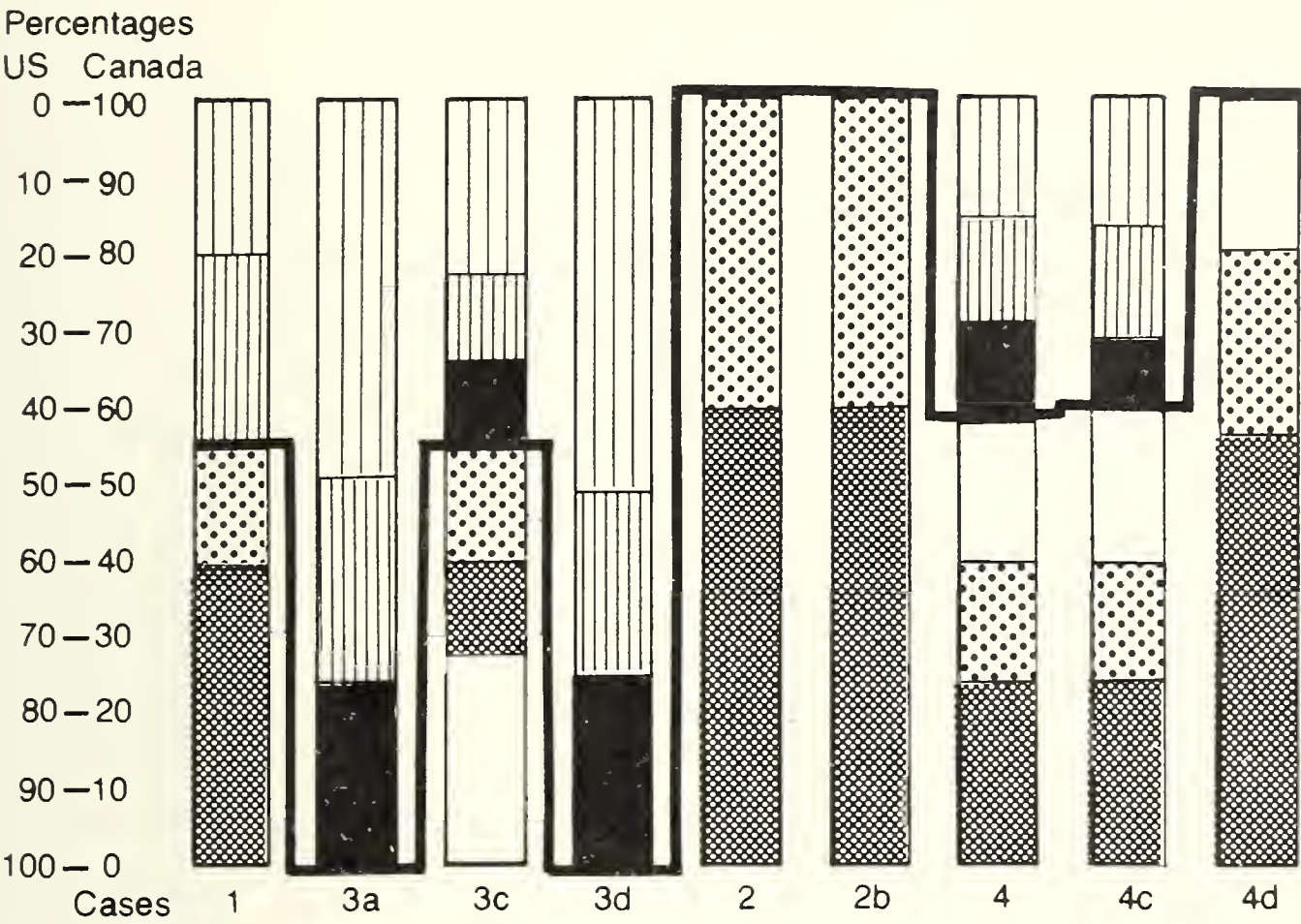


Figure 6
Distribution of value-added, alternative tax-tariff scenarios
($\alpha_i = 0.5, i = X, Q, I; \sigma_X = 0.99, \sigma_I = 2.5, \sigma_Q = 0.01$)

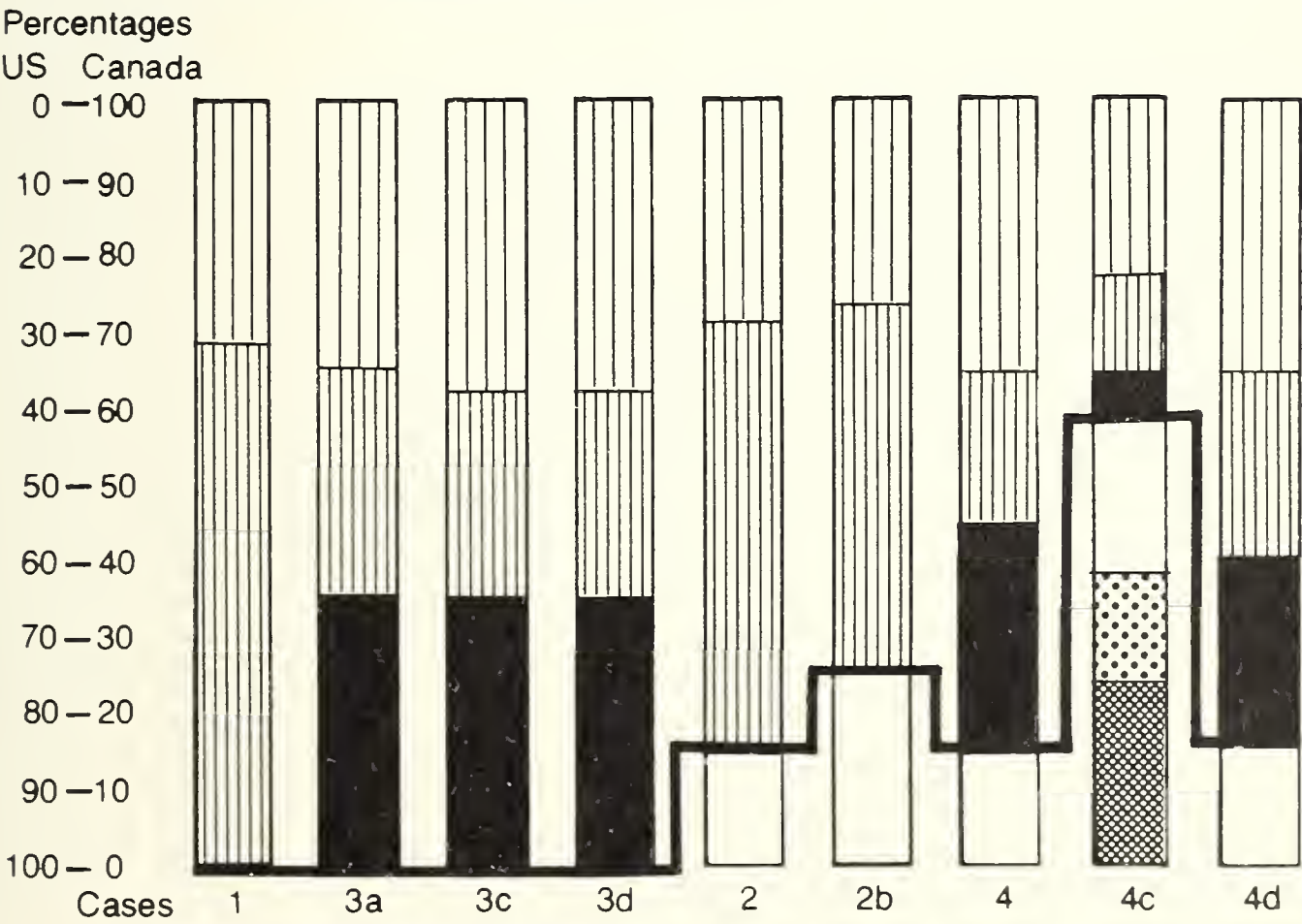


Figure 7
 Distribution of value-added, alternative tax-tariff scenarios
 ($\alpha_i = 0.5, i = X, Q, I; \sigma_x = 0.99, \sigma_I = \sigma_Q = 0.01$)

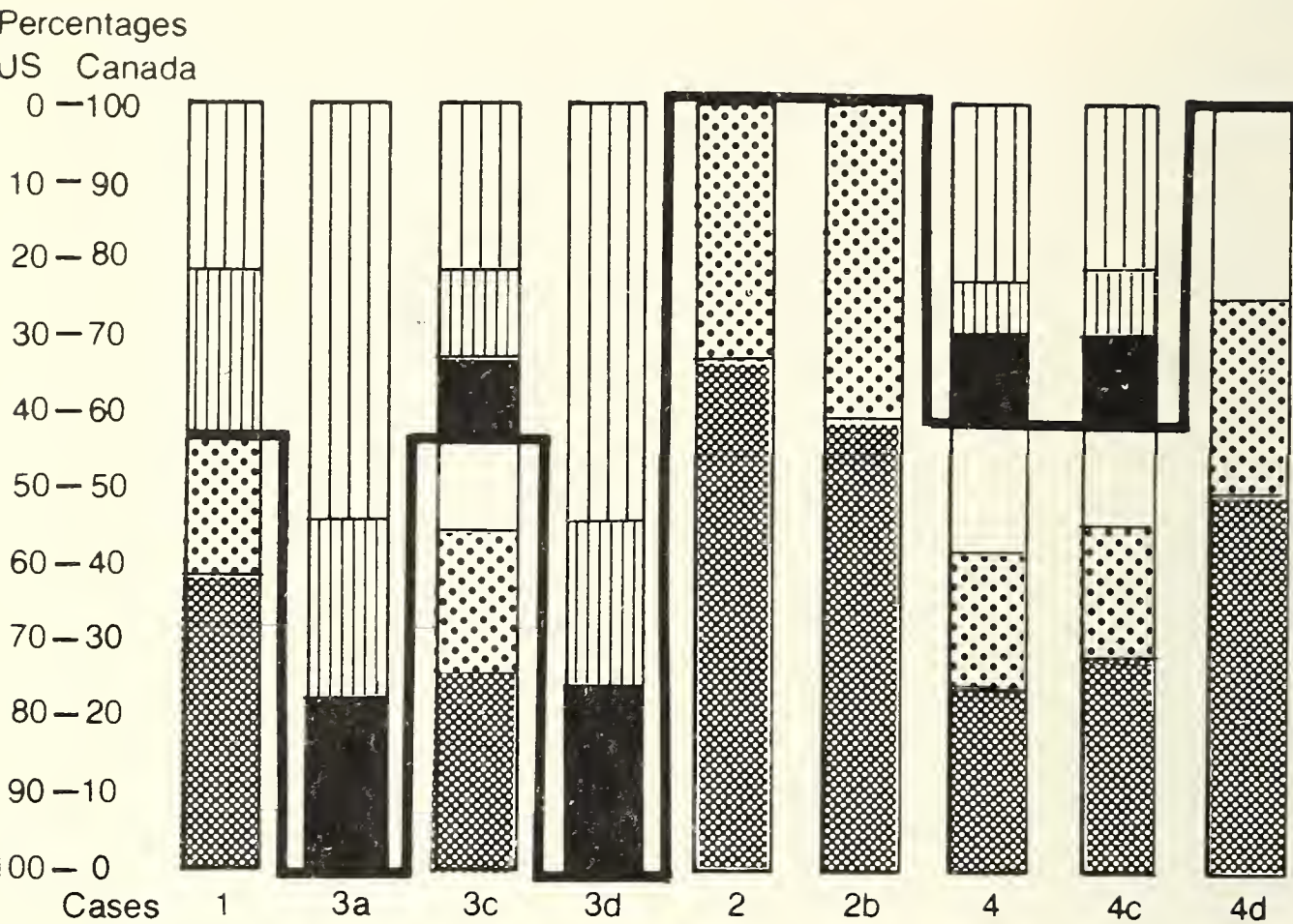


Figure 8
 Distribution of value-added, alternative tax-tariff scenarios
 ($\alpha = 0.5, i = X, Q, I; \sigma_x = 0.99, \sigma_I = 0.01, \sigma_Q = 2.5$)

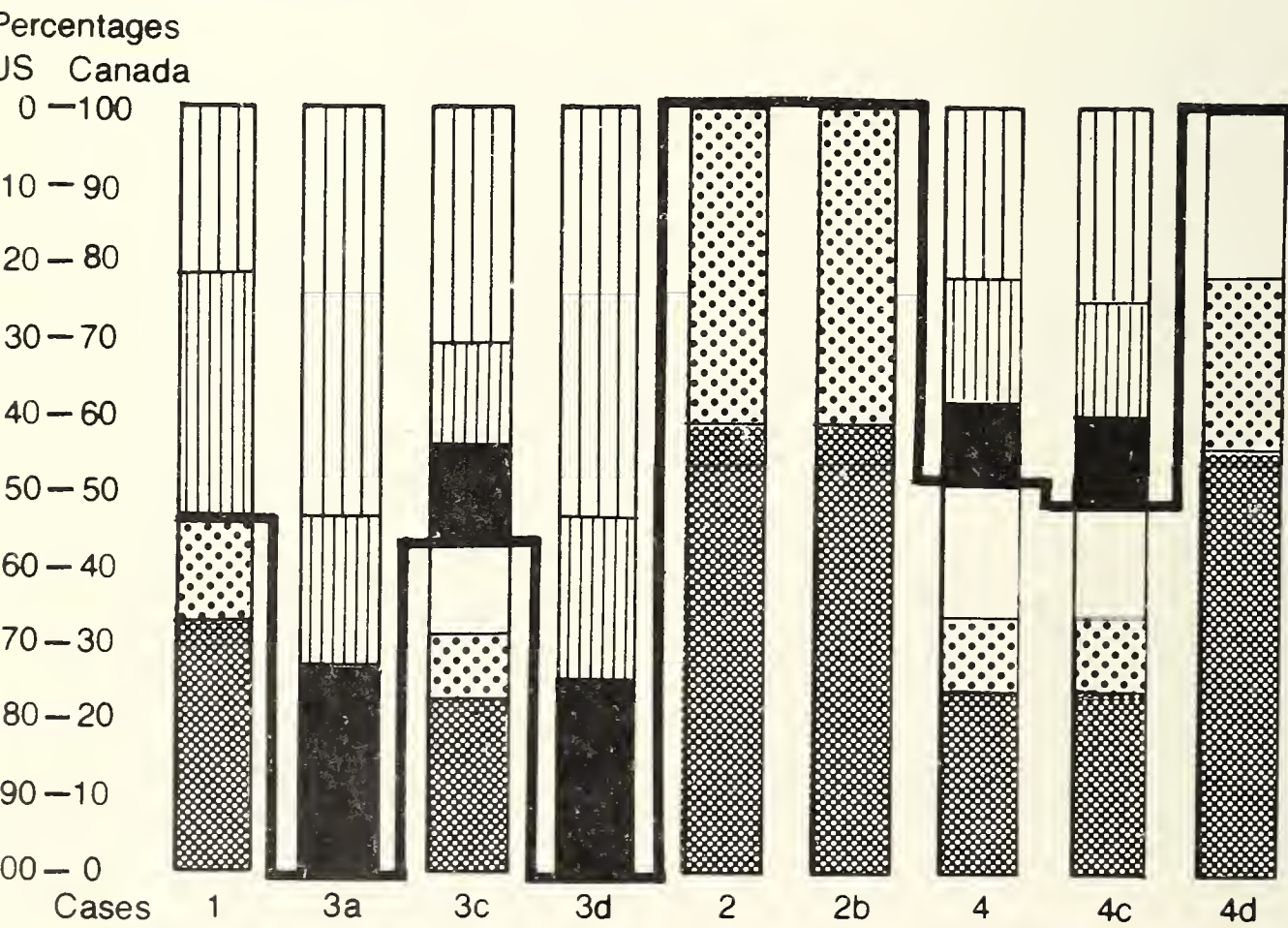


Figure 9
 Distribution of value-added, alternative tax-tariff scenarios
 ($\alpha = 0.75, i = X, Q, I; \sigma_X = \sigma_I = 0.99, \sigma_Q = 0.01$)

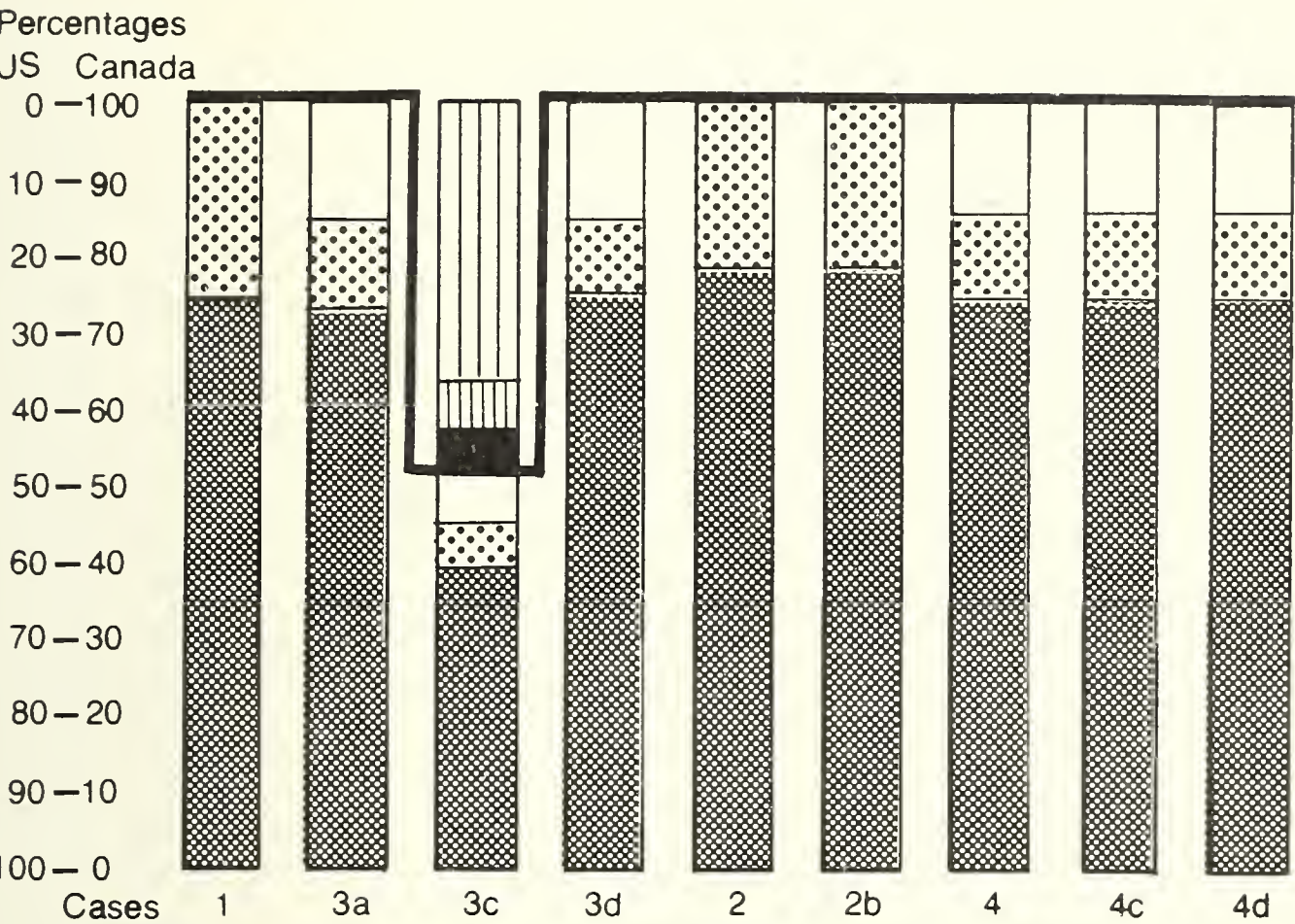
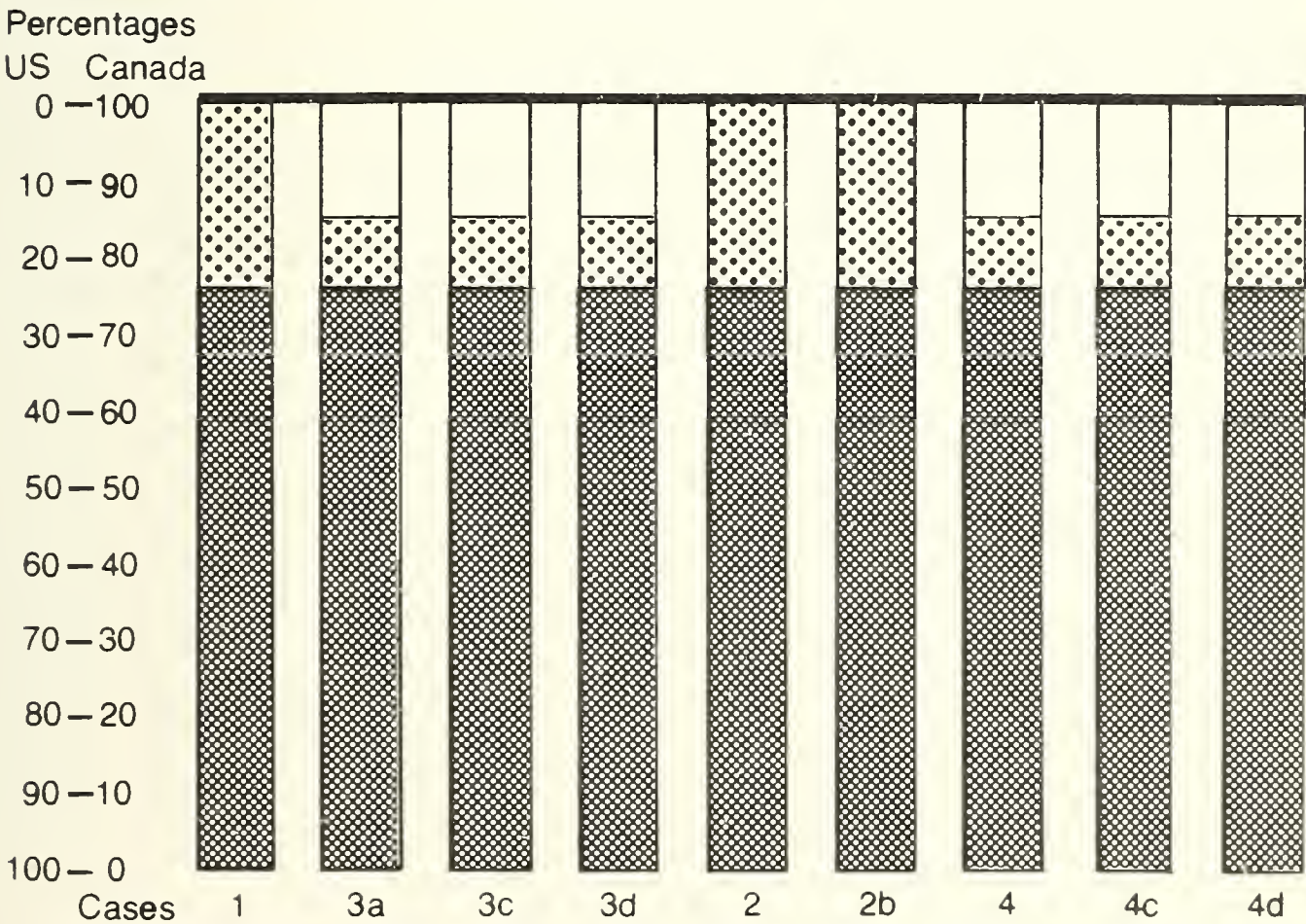


Figure 10
 Distribution of value-added, alternative tax-tariff scenarios
 ($\alpha = 0.75, i = X, Q, I; \sigma_X = \sigma_I = 0.99, \sigma_Q = 2.5$)



6

The involvement of three or more countries

INTRODUCTION

Our analysis to this point has been concerned with the possible application of transfer pricing by multinational enterprises in trade between two countries. This case was chosen not only because it is analytically tractable but also because it incorporates almost all of the economic (as opposed to purely fiscal) problems that arise in the transfer-pricing context. It is, however, a simplification of the 'real world' situation. Many multinationals operate in more than two countries, and the 'quintessential' multinational, which has given rise to much of the political and economic concern, is one which operates in perhaps a score or more countries, including one or more so-called tax-haven jurisdictions, and is often pictured as shifting assets, products, and profits between its various affiliates almost at will, to the detriment of labour in the 'home' country and of tax officials everywhere. It is therefore imperative that the extension of operations beyond the two-country case be considered. In view of the deep suspicion which surrounds the subject, specific consideration must be given to tax-haven countries, their use and abuse.

PRODUCTION IN THREE OR MORE COUNTRIES

In the two-country case, decisions about the location of specific parts of the production process were seen to be determined by considerations of cost-minimization. In a tax-free, tariff-free world, these decisions were shown to be dominated by the relative costs of primary factors of production or, more precisely, by their absolute costs at prevailing exchange rates. Given these costs, there is a set of production functions under which production will be cheaper in one country, and another set under which it will be cheaper in the other. Possible processes

will be allocated to one country or the other depending on their respective implicit capital-intensities. Extension of the model to the three-country case will result in one country being intermediate, in terms of relative labour scarcity or labour cost, between the other two. There will be a three-way partition of the possible production processes in which one group, highly labour-intensive, will be most economically carried out in the low-wage country. The highly capital-intensive processes will be attracted to the high-wage-low-capital-cost country, while an intermediate group of activities will be most cheaply carried out in the intermediate country.

This three-way specialization is perhaps best illustrated by an example. The processes are assumed to be characterized, as in chapter 4, by Cobb-Douglas production functions, with α values ranging from 0.1 to 0.9. Capital and labour costs, at prevailing exchange rates are assumed to be

	Country A	Country B	Country C
Capital	1.00	1.50	3.00
Wages	3.00	1.50	1.00

A comparison of costs for the nine processes is given in Table 4, which indicates that processes $\alpha = 0.1$ to $\alpha = 0.3$ will be most economically performed in Country C, processes $\alpha = 0.4$ to $\alpha = 0.6$ in Country B, and processes $\alpha = 0.7$ to $\alpha = 0.8+$ in Country c.

As the analyses in Chapters 4 to 6 indicated, the relative costs of carrying out these processes in different locations will be influenced by the application of corporate income taxes, which increase the cost of using capital in equity form, and, as far as applications intended to serve a given market are concerned, by customs duties imposed on international movements of goods. These fiscal impositions therefore influence the nature and extent of international specialization which takes place. The analysis also indicates that transfer pricing within a multinational corporation may be used, within the limits imposed by valuation rules, to reduce the distortions created by fiscal measures of the types noted. Thus there is no difference in principle between the two-country and the three-country case.

We should note, however, that as a practical matter introduction of a third (or subsequent) country introduces a new degree of complexity into the problem and an additional degree of freedom into possible solutions. Canada has historically been a country in the middle, with lower wages and higher capital costs than the United States but higher wages and lower capital costs than many LDCs. This is a position it shares with many of the countries in Western Europe

TABLE 4

Least-cost solutions for various technologies and differing factor costs

Technology ()	Country A $P_K = 1.00$ $P_L = 3.00$	Country B $P_K = 1.50$ $P_L = 1.50$	Country C $P_K = 3.00$ $P_L = 1.00$
0.1	370.6	207.8	158.5*
0.2	397.4	247.7	197.9*
0.3	398.7	277.5	258.3*
0.4	381.8	295.8*	306.2
0.5	346.7	300.0*	346.7
0.6	304.2	294.2*	379.8
0.7	255.9*	276.0	397.5
0.8	205.9*	247.5	398.6

NOTE: Asterisk denotes least-cost solution.

and with Japan, although the precise middle positions of these countries may vary. We should accordingly expect to find Canada and the other countries in this group specializing in processes and in products intermediate in capital intensity between those of the United States and those of the LDCs. Manufacturing operations of this type would appear to provide natural objectives for specialization not only in Canada but also in western Europe and Japan. In addition, of course, Canada has attracted and will continue to attract a variety of natural-resource-based industries, for which the availability and low cost of the resource can offset possible labour or capital cost disadvantages.

The US tariff structure, however, protects many industries in which the United States does not appear to have a comparative advantage and applies particularly high rates of effective protection to the final stages in the production process. It appears to have been intended to extend the range of processes carried on downward into less capital-intensive industries than would ordinarily locate in the United States. Such a structure effectively forces intermediate-labour-cost economies to restrict their size, reduce their wage rates, or otherwise accommodate themselves to the use of less capital-intensive processes than would be their normal habitat.

At the same time countries at the other end of the capital-labour cost spectrum have applied protective tariffs which seek to encourage expansion of capital-intensive processes beyond the range of those that would normally locate there. As a consequence the countries occupying the middle ground have had their natural range of processes restricted from both ends and have sought ways of accommodating themselves to this situation. Tariff structures of such countries, including Canada, have typically sought to protect both relatively capital-

intensive and relatively labour-intensive industries in order to regain operating space at both ends, but have all too frequently created purely domestic industries with little or no ability to compete internationally.

In such a context complete freedom for transfer pricing would negate both the US tariff and the Canadian tariff at one end and the Canadian tariff and tariffs of low-wage countries at the other. In short, it would result in a pattern of specialization more nearly like that which would prevail in the absence of tariffs. This would probably result in increased efficiency and a net gain in economic welfare, if accompanied with suitable monetary, fiscal, and exchange rate policies.¹ However, transfer pricing freedom is effectively curtailed in many countries by regulations of the type referred to in chapter 3. While comparisons of the effectiveness of curtailment are difficult, it seems likely that US restrictions are perhaps the most effective. In some cases they create more protection for US activity than the tariffs they supplement. Given the generally high level of enforcement, Canadian restrictions are probably not far behind. While similar restrictions may exist on paper in many LDCs, they are rendered ineffective by the substantial laxity of tax administration generally existing in such countries. This leaves virtually intact the tariff-induced distortions at the upper end of the capital-intensity range as well as those induced by the Canadian tariff at the lower end. Only the distortions imposed by LDC tariffs are likely to be significantly reduced as the consequence of the transfer pricing capability in multinationals. Whether this creates any significant benefits for Canada is not clear.

High rates of corporate income taxation in the United States create the opportunity for competing countries to offset the effect of higher local capital costs by imposing lower corporate income tax rates. The usefulness of this device is severely limited because it is restricted by the application of US taxes at US rates on foreign-source income. Although liability for the full US tax is generally deferred until profits are remitted under these rules, taxation at rates below the US rate is apt under such circumstances to do little besides creating a windfall for the US treasury, albeit a delayed one. Similar objections can be raised against other countries like Canada which tax extraterritorial income. Lower rates of domestic taxation *do* strengthen the hand of local firms competing with foreign multinationals; this is apt to be of limited value if domestic capital sources are limited or if technology is subject to control by multinationals. Here too the relatively stringent US rules on transfer pricing may restrict the capability of other jurisdictions to create local incentives for multinationals.

1 This statement neglects government revenue considerations. By implication it is assumed either that equivalently efficient alternative revenue sources are available or that reduced revenues can be accommodated by the elimination of expenditures having benefit/cost ratios less than 1.0 or some combination thereof.

A partial exception exists in the case of so-called tax haven jurisdictions, where very low or zero rates of corporate taxation may be used to attract large volumes of transactions which have no obvious economic reason for existence other than tax avoidance. These transactions embody little local resource content, but (presumably) enough to make it worthwhile. It is to the peculiar uses of this type of third-country affiliate that we now turn.

THE USE OF TAX-HAVEN JURISDICTIONS

Tax-haven jurisdictions were defined above as countries which apply zero or near-zero rates of corporate income tax. Among the countries so classified are Bermuda, the Cayman Islands, Honduras, Liberia, Liechtenstein, Monaco, and Panama; for some purposes Switzerland and the Netherlands may also be so classified. With the exception of the two last mentioned, the countries in the group are all relatively underdeveloped, and have used the device to attract 'corporate shell' subsidiaries through which transactions are routed to avoid taxation elsewhere. The legal and banking business resulting from these transactions creates a sufficient addition to relatively limited national income to make the whole process worthwhile. Some tax revenue is derived from corporate registration fees, minor transfer taxes, etc., which provide an attractive addition to the local tax base. For the most part these countries are the home bases not of multinationals but of subsidiaries inserted at strategic points in the corporate tax structure. Switzerland and the Netherlands differ in that they are the home bases of major multinationals, e.g. Brown-Boveri, Ciba-Geigy, and Nestlé (Swiss); Phillips, Royal Dutch Petroleum, and Unilever NV (Netherlands). These organizations had become international in stature well before the general rise in corporate tax rates after the second world war that created opportunities for tax havens. Both of these countries have economies based to a significant degree on the export of managerial skills, made possible only by the use of multinational enterprises, given the small size of the domestic base. The adoption of favourable corporate tax policies by Switzerland and the Netherlands can best be viewed as a protectionist device, intended to preserve their comparative advantage in this type of activity in the face of nationalistic measures elsewhere. In the process, however, Switzerland and Holland have attracted their share of what are, in effect, tax-haven subsidiaries.

Most tax-haven subsidiaries are purely financial holding or trading companies which purchase from one source and resell almost immediately; they seldom have any significant physical assets other than inventories of goods in transit. The most important exception is provided by the so-called flag-of-convenience shipping lines which account for a significant fraction of the world's tonnage.

The prototypical flag-of-convenience countries are Panama, Liberia, and Honduras; their establishment and leadership in this field is due as much to attractive (i.e. almost non-existent) labour legislation as to low tax rates.

No discussion of tax-haven jurisdictions in Canada should fail to note that the relative importance of Canada in this capacity has faded in recent years. For a long time Canadian law permitted Canadian-incorporated companies having no operating assets in this country to operate on a tax-free basis in this country. A number of oil company subsidiaries operating in the Middle East and in Latin America were incorporated here in the 1920s and 1930s, as were companies in a variety of other fields. The most recently publicized examples which took advantage not only of certain tax provisions but also of exemptions in Canadian securities laws were the key companies in the ill-fated Cornfeld financial empire, including Investor's Overseas Services Ltd and Fund of Funds Ltd. Tax-haven countries are to some degree unpopular with countries which are not, which see them either as unfair competitors or as conduits enabling their own residents to escape taxation or other domestic legislation. For a number of years Canadian public policy has tended to discourage the use of Canadian corporations for such purposes, not always successfully as the Cornfeld episode shows. Whether this is from an altruistic desire to be a good international citizen or concern over possible retaliation is not clear.

Tax-haven jurisdictions appear to have two basic functions: to facilitate the mobility of capital funds between a group of external subsidiaries and to skim off profits on transactions in commodities or services either between subsidiaries or between the parent company and third parties. Only the latter appears to have important transfer-pricing implications; the former appears in fact to reduce incentives to engage in the practice.

The use of tax havens as a financial-mobility-facilitating device is frequently found in the corporate structures of multinationals that do business in a large number of countries that tax income from foreign subsidiaries as dividends are received, with or without a credit for foreign taxes paid. Under such legislation it is difficult as well as costly to invest earnings from one subsidiary in another, because of the need to remit dividends to the parent and thereby to incur a tax liability. Continued deferral can be obtained through the use of a so-called base country subsidiary in a tax-haven jurisdiction. This is a subsidiary which holds the shares in other foreign subsidiaries and is in turn wholly owned by the parent. The base country subsidiary can 'shortstop' dividends from those foreign subsidiaries in a position to pay dividends and reinvest them in other subsidiaries without any dividend remittance to the ultimate parent, thus postponing the tax liability of the parent company and preserving the benefits of lower tax rates in the operating countries. Unless these tax rates are lower than those in the parent

country, there is no particular advantage to using the device, because credits against foreign taxes paid would offset tax liability in the parent's home country in any event. The device has been widely used, but changes in US tax legislation following the 1971 US balance of payments crisis have operated to strip base-country subsidiaries of their usefulness in this regard, since foreign income earned in such subsidiaries may now be taxed when earned rather than when remitted to the United States.

It should be noted that the use of base-country subsidiaries is not the only means of achieving these objectives. Operating companies are not affected by the tax changes, and taxes on the income of operating subsidiaries may still be deferred until remitted as dividends. Therefore it is possible to shift funds between operating subsidiaries by selling shares or lending from one subsidiary to another. This device is more complicated to use, may create unforeseen foreign tax liabilities, and can put ownership of stock in or claims against a subsidiary in one country into the hands of a subsidiary in a third country, increasing exposure to political risks such as nationalization. The capital structure of companies using this approach to intercorporate financing tend to become incredibly complex, as funds for a growing affiliate may be taken from one subsidiary on one occasion, from another the next time, as dictated by the availability of cash within the cash-supplying affiliates. One of the classic examples of this type of financing was the former Canadian mining multinational, Ventures Limited, which owned directly or indirectly several dozen operating subsidiaries, including Falconbridge Nickel, but had majority stock interests in only a few. After the death of its founder, Thayer Lindsay, Ventures was eventually wound up. The individual who presided over the unscrambling of this maze, Robert B. Anderson, subsequently became Secretary of the Treasury in the United States.

Despite the complexity of the resulting capital structures, intersubsidiary financing is likely to grow as a consequence of increased restrictions on the use of base-country subsidiaries.

It should be noted that the use of base country subsidiaries does not involve transfer pricing, though it may well result in a postponement of domestic tax liability in the home country. An assessment of their impact and desirability depends on one's views about the taxation by one country of economic activity in another. Much of the literature on the topic is of US origin and sees the worldwide taxation of income accruing to US-owned capital as a desirable objective, not only when it accrues to US individuals as dividends or capital gains but also when earned at the corporate level as well. If the second-level taxation implicit in the US corporate income tax were not extended beyond US borders, there would be an incentive for corporations to export capital to avoid the second level of tax. The present provisions permitting a tax credit for foreign taxes and

delaying the liability for US tax until dividends are received is a compromise between the desire to extend the second level of tax internationally and the desire to permit US-owned subsidiaries to compete with local enterprises in countries with lower tax rates. The latter activity, of course, does involve the export of capital. Proposals to eliminate the foreign tax credit or to eliminate the deferral, of which the recent Burke-Hartke bill is an example, represent a deliberate attempt to reduce the incentive to invest abroad, thereby encouraging investment at home to increase employment and raise wages in the United States.

There is, however, another view. Many capital-importing countries face high capital costs because of the scarcity of domestic saving and the risk premium attached by outside investors to investment there, and they regard the choice of a corporate tax rate as a perfectly legitimate device to assist in offsetting these higher costs and provide incentives to prospective foreign suppliers of capital and technology. The extraterritorial application of US (or Canadian) tax law may be viewed in the capital-importing countries as interfering with this legitimate objective.²

It does not, of course, interfere with portfolio, as opposed to direct, investment, providing the portfolio is personal or held by an intermediary which is either tax-exempt or entitled to flow-through status. Direct investment, however, offers a package that countries as well as investors find attractive. It is usually accompanied by technology transfers, though these may be 'unbundled' and arranged separately by the importing country. From the investors' point of view the multinational appears to offer economies of scale in effecting the requisite foreign exchange transactions, some degree of ready-made diversification, and an organizational structure which provides some degree of protection against expropriation, nationalization, or exchange controls which might adversely affect recovery of their investment or the earnings on it. To the extent that the multinational can do so, and this is not wholly independent of its ability to manipulate transfer prices, it may be able to provide the funds at lower cost than that obtainable via the portfolio route, and thus be more attractive to the importing country. Indeed, the overseas lending activities of US banks excepted, North American portfolio investment in LDC has been conspicuous by its virtual absence since the foreign-bond debacles of the 1930s.

- 2 It would seem that the capital-importing countries cannot win. If they keep tax rates down, they are accused of stealing US jobs, while if they raise them to US levels they are accused of raiding the US treasury. The latter complaint was frequently raised against oil producing countries, for example, after their adoption of the 50-50 'profit-sharing' formula, which substituted income taxes at approximately the US rate for royalties previously expensed.

As suggested, transfer pricing provides a third device to move capital between subsidiaries. This objective can be achieved by under-pricing goods or services sold by the capital-receiving subsidiary, allowing the latter to 'finance itself' through retained earnings. However, the funds so transferred will in effect be taxed by the receiving country at the applicable corporate tax rate and may be taxed in the supplying country as well if fair market value is deemed to be received by the supplying country. The extent of such double taxation is of course dependent on the level of tax enforcement in the two countries. Unless that is very lax, this avenue is likely to be more expensive than direct movement of capital funds between subsidiaries. But it is likely to be used as a means of evading exchange controls, restrictions on capital movements, or multiple exchange rates in situations where high-cost movement is preferred to no movement at all or movement at even higher costs. While such uses are among those which have evoked the loudest complaints from capital-importing countries, it must be borne in mind that they function as a last line of defence for the investor faced with a situation he would not otherwise have entered at all. Unless alternative and fully credible means of safeguarding repatriation are found, successful restrictions on the use of transfer pricing for this purpose will only restrict the availability of capital to the principal complainants.

7

Transfer pricing of intangibles

INTRODUCTION

One area in which transfer prices are applied has in recent years given rise to perhaps more controversy than any other. This is the area of intercorporate payments for management fees, royalties in respect of the use of patents and trademarks, sharing of research and development costs, interest and principal repayments on intercorporate loans, and other transactions that do not involve the exchange of physical commodities. Some important issues of principle are involved in the area, as well as the more obvious tax-erosion and location-shifting questions. While such payments have been an integral part of corporate practise for decades, attention has not been focused on their transfer-pricing implications until the last decade. Pressure on US multinationals by US authorities to increase the flow of such payments to the United States to help resolve the chronic US balance of payments problem has been a major factor in highlighting this issue and creating concern in other countries, including Canada.

Our analysis of optimum transfer pricing (from the corporate point of view) in preceding chapters has indicated that, in general, selecting an appropriate transfer price involves the simultaneous consideration of tariff and corporate income tax considerations, which often operate in opposite directions. For example, reducing a transfer price may reduce import duties but increase taxable income in a high-tax-rate jurisdiction. An appropriate choice in the absence of constraints will ordinarily involve a comparison of the marginal tax rate with the effective tariff rate, and raising the price paid for imports if the tax rate is higher than the duty rate, and vice versa if the tax rate is lower. In principle, the unrestricted availability of any one of the intangible payment categories enumerated above frees the corporation from the need to balance tariff rates against tax rates and to make such choices. It provides those responsible for intercorporate

pricing with an additional degree of freedom, enabling the simultaneous minimization of both types of liability. Transfer prices on physical commodities can be set to minimize tariff liabilities, while the resulting income can be reallocated to the parent or an affiliate located in the jurisdiction having the lowest tax rate by means of appropriate management fees or royalty arrangements. While the theoretical opportunities for manipulation should be apparent to all but the most incompetent of economic theorists, those who pretend that this model bears any resemblance to reality must explain why all multinational profits do not accrue in Liechtenstein or Switzerland. In fact there are serious constraints which severely limit the extent to which such payments can be manipulated, as we shall see below.

MANAGEMENT FEES

Management fees are charges assessed by parent companies on subsidiaries for management services provided by the parent, either on a continuing or special project basis. They may or may not reflect a truncation of certain executive functions within the subsidiary and the transfer of these functions to the parent, with corresponding savings to the subsidiary. Wholly owned subsidiaries in particular may have an abbreviated management structure in which parent company officials are also officers of the subsidiary as part of their jobs with the parent, by whom they are paid. In such circumstances, management fees are an appropriate device by which to levy the cost of the services provided against the affiliate.

A rather more difficult question arises in the case of the non-wholly owned subsidiary in which there is a substantial minority stockholders' interest. At least a portion of the expenses of the parent must then be viewed as incurred in looking after its investment in the affiliate and comparable in character to the portfolio management costs incurred by 'outside' investors. The latter cannot be charged against the corporation, and there must be serious doubts whether the parent's charging of expenses which are similar in character does not constitute unfair dealing vis-à-vis the minority stockholders.¹ Concern over possible repercussions in this direction has probably antedated concern over tax implications

1 Similar considerations apply with respect to costs incurred by the subsidiary to meet accounting or other requirements of the parent. For example, many Canadian subsidiaries keep accounts in US dollars or sterling as well as in Canadian dollars, for purposes of reporting to the parent and consolidation with the accounts of the parent. Such accounts are of no value to Canadian shareholders and should, it is submitted, be paid for by the parent, either directly or by way of a reduction in management fees otherwise payable.

in the case of subsidiaries with minority shareholdings, though the precise legal position is not clear and there is a notable lack of case law in this area, at least in this country. While many such companies have for decades paid management fees to their parents, it would appear from the US guidelines program that many others did not but simply absorbed some or all of the costs associated with administering foreign subsidiaries as parent company overhead. In the case of wholly owned subsidiaries there is of course no unfair-dealing problem in this regard, and the problems centre on the appropriateness of the intercountry allocation of taxable income and on balance of payments implications.

Current US guidelines appear to require that foreign subsidiaries be charged a management fee which covers direct parent company expenses incurred in the provision of management services, plus an appropriate share of allocated indirect expenses, plus a markup of 10 per cent or more, bearing an appropriate relation to the profit margin on domestic sales.²

This policy has not been viewed with unanimous approval in other countries. While Canadian tax rules require the assessment of similar management fees against subsidiaries of Canadian multinationals, they do not permit the deduction by Canadian subsidiaries of management fees so calculated and paid. Deductions for management fees paid to foreign parents are restricted to reimbursement for expenses,³ while a section in the Ontario Corporation Tax Act effectively forbids their deduction at all in respect of the provincial corporate tax.⁴ There will thus be some degree of double taxation with respect to management fees paid by US-controlled subsidiaries operating in Canada, and particularly in Ontario. The US guidelines were adopted as part of the package of balance-of-payments 'reforms' that included the DISC program; the Canadian and Ontario rules seem to have been adopted in response to them to prevent erosion of the Canadian tax base. Other countries are perhaps more lax, but it is clear that the pricing of management services is subject to precise controls in Canada and the United States. Any manipulation of such charges is more apt to be devoted to the attempt to avoid double taxation than to the avoidance of basic taxes.

The degree to which there are revenue implications in the management fee area is dependent on the extent to which such fees were being levied at rates below the US guidelines, or not levied at all prior to their introduction.

There are also economic or locational implications in this area. Multinational corporations are seldom created as such but grow from corporations which have

2 See Prentice Hall, *US Taxation of International Operations*, paragraph 9509.

3 Or become subject to a 25 per cent withholding tax in their entirety. Income Tax Act, s. 212(1), (4). See M.J. O'Keefe (1975).

4 Ontario, *Corporations Tax Act*, S.O. 1972 c. 143, as amended by S.O. 1973, c. 42, s. 4

become well established on a national basis. As a consequence, head office locations are usually the consequence of historical accident rather than deliberate choice; instances of multinationals changing their home base location are rare. However, the degree of centralization or decentralization of functions and the extent to which management functions may be performed in subsidiaries are open to choice. Unregulated management fees, cost-based management fees, and cost-plus management fees would all appear to be neutral with respect to the geographic location of managerial functions if they are accepted by both countries involved. The former US system, in which management expenses could be charged against domestic income in computing US taxes, while subsidiaries were permitted to bear tax at possibly lower rates (until remitted), was in effect non-neutral, encouraged firms to incur management costs in the United States where possible, and provided indirect support to the expansion of US-based multinationals. These longer-term objectives seem to have been exchanged for short-run revenue gains and balance of payments objectives in the move to neutrality.

Given the US guidelines, however, the present Canadian rules, particularly as applied to Ontario, are non-neutral, since they create partial double taxation on managerial services provided by the parent which can be escaped by performing the services within the Canadian subsidiary. They thus tend to encourage the shifting of management services into Canada.

PAYMENTS FOR GOODWILL

This term is used here to describe payments made by way of royalties for the use of patents or trademarks, for technology support, marketing privileges, and so on. Any or all of these may be provided by the parent to the subsidiary and contribute either to its productive efficiency or to the maintenance of some degree of market power which improves its profitability. In either case its value as a going concern is presumably increased by a 'goodwill' component. Except in cases in which the multinational is a diversified conglomerate and the subsidiary has a product line unique to itself and non-existent elsewhere in the organization, such support is common, and the payment of royalties for the use of trademarks or patents is also common. The most common basis of payment is through a per-unit charge on output or a percentage of sales.

The valuation of such services poses a difficult problem, since their value may be quite unrelated to costs and is dependent on the additional earning power generated for the subsidiary as a result of its ability to use the processes, trademarks, or marketing techniques made available. In the absence of corporate income taxation there would be no reason to levy any charge on subsidiaries for these services, unless there were minority shareholders who were expected to

make some payment for the goodwill in which they share. Arm's-length markets also exist for patent licences and trademarks; licensing fees may be any amount up to the additional earning power generated by the patent or trademark, i.e. up to the point where the residual goodwill has zero value. Where competition between prospective licensees exists, the charge will usually approach the upper limit of this range. Application of this standard in the affiliated company case would transfer all excess earnings of the affiliates to the parent company, a transfer which in the absence of differential tax rates or minority shareholdings would be pointless.

Once again, this is an area in which US revenue authorities have recently been pressuring parent companies to ensure that 'proper' charges are levied against foreign subsidiaries. Tax authorities in the latter's host countries have, not unnaturally, been reluctant to accept increased levels of payments under such contracts. At the heart of the problem is a question whether the goodwill benefits accruing in the form of above-average profits to subsidiaries in a given country should be taxed there or in the home country of the parent which provided the 'know-how' that made the profits possible. Recognition of the prior claim of the host country would seem to require that no such payments should be deductible. The US position would seem to be that these are returns to intangible property located in the United States. If this view were accepted, any level of royalty payments would be tolerated as long as the residual rate of return in the host country was equal to the cost of capital; presumably such an arrangement would be tolerated if it were negotiated between independent companies. Although the patents and trademarks involved may technically be Canadian patents or trademarks, they are so only because foreign owners of patentable processes or trade names must register them in Canada to protect them in this country. This is obviously a matter on which future tax treaties will have to be more specific.

Double taxation is a serious problem for the multinational in this context only if the host country tax rate is equal to or close to the US level. Inclusion of royalty payments in the US tax base and non-deductibility or partial deductibility in the host country simply means that the host country tax base is greater than the US tax base with respect to the subsidiary's income. If the host country tax rate is sufficiently below the US rate that aggregate taxes payable in the host country do not exceed the tax payable at US rates on the smaller base, the foreign tax credit provision of the US legislation will prevent double taxation.

Within these limits, changing transfer prices with respect to royalties have effects which appear to be restricted to the allocation of tax revenues between the home country and the host country. Effects on 'real' variables appear to be insignificant unless double taxation on a part of the charge is a possibility;

double taxation on the payment of royalties for the use of patents or trademarks may, if significant, shift production of the items in question out of the subsidiary so affected, either to the parent or to an affiliate located elsewhere.

RESEARCH AND DEVELOPMENT EXPENDITURES

Research and development expenditures are of growing importance in many industries and provide a potential avenue for manipulation by multinationals. Of their very nature these expenditures relate to future output, or hoped-for future output, rather than current output. Such expenditures do not lead to the acquisition of tangible assets, however, and may not lead to anything at all. Accounting conservatism therefore dictates that they be expensed rather than capitalized lest income be overstated. Tax authorities in most countries have accepted this treatment, not only because of its conformity with accounting standards (which are in many instances influenced by tax treatment of certain transactions) but also to provide an incentive to carry on an activity which may lead to higher productivity, improved products, and other economic benefits. In addition, many countries have subsidized R and D expenditures undertaken within their borders. Canada has a number of such programs, including DIP, PAIT, and IRDIA, which together accounted for some \$114 million of expenditures in the 1975-6 Estimates.

Many multinationals have a policy of assessing R and D expenditures against all subsidiaries as a percentage of sales or some similar basis, reimbursing subsidiaries carrying out research for their contribution to the over-all corporate research effort. However many apparently did not, if we are to judge by US guidelines, but were content to carry on research in the parent or a subsidiary in another high-tax-rate jurisdiction and to absorb the expenses there, thereby increasing profits in low-tax-rate jurisdictions. Pressures have accordingly been applied to ensure that foreign subsidiaries bear an 'appropriate' share of R and D costs.

While assessing a uniform charge against sales or value added will probably meet US treasury requirements and those of most other countries including Canada, we are sceptical about its appropriateness. For one thing, the R and D expenditures may relate to product lines or prospective product lines which are not, and never will be, of relevance to the subsidiary. The former may relate to sophisticated end-use applications while the subsidiary produces a raw material which is competitively marketed. Our other concern arises from the obvious causal link between R and D expenditures and payments for the use of the resulting technology. If royalties are raised to capture the full value of the technical goodwill employed, so that subsidiaries earn nothing more than a competitive return

on assets employed, the subsidiaries should not, in our view, be assessed any of the R and D costs, which should be borne by the parent to whom the royalty benefits accrue. A somewhat more appropriate arrangement, in our view, is one in which royalties are so calculated but pooled and distributed to the subsidiaries on a basis consistent with the latter's contributions to the related R and D expenditures.

The primary effects of alternative transfer pricing arrangements with respect to R and D expenditures appear to be fiscal. Such expenditures are unrelated to current production, and decisions with respect to the latter are unlikely to be unaffected by the tax treatment of the former. The only real variables which could be affected by constraints on intercorporate payments for R and D expenditures are the locations of R and D activities themselves. Given apparent concern in some quarters about the relatively lower share of domestic R and D expenditures in value added in Canada, when compared with certain other countries, proposals to disallow payments by Canadian subsidiaries for R and D performed elsewhere have occasionally been advanced. Given the relatively small fraction of global R and D expenditures that would be subjected to double taxation in consequence of such a move, we are inclined to doubt that efficacy of such a proposal. If it is desired to increase the level of Canadian R and D other measures must be sought. In the light of the available evidence with respect to the benefits resulting from fiscally induced R and D expenditures, it might be more appropriate to question the desirability of the objective (Howe and McFetridge, 1976).

MARKETING ARRANGEMENTS

Many, if not most, subsidiaries not only carry out primary production and manufacturing activities for local or export markets but also have exclusive marketing rights for products produced elsewhere within the global organization; and most market their own finished products in other countries through the parent or other affiliates. As a result there is scope for transfer-price manipulation within the structure of wholesale prices charged to non-arm's-length marketing organizations in export and import transactions. There is probably at least as much scope for income-shifting in this manner as in any other area of transfer pricing. It is also a major area of controversy and has attracted most litigation.⁵ That is probably because manipulation at this level is more easily detected than manipulation in the pricing of intermediate products rather than because of in-

5 The leading cases involving transfer pricing here, in both Canada and the United States, involved sales of finished products to foreign subsidiaries.

trinsically greater opportunities. Discounts allowed arm's-length distributors, either by the company itself or by others in the same industry, have usually been taken by tax authorities as evidence of what is appropriate, though additional allowances for services offered by affiliates which are not offered by independent distributors may be permitted if appropriate cost evidence can be provided in justification. There is always some margin for discretion, however, and shifts of even 1 or 2 per cent of sales receipts via this mechanism may shift a much larger proportion of profits.

Here again, the major effects appear to be on revenue. Unlike manufacturing operations, which can be assigned to least-cost location, marketing and distribution must be located in or near the market being served, and there are advantages in convenience for customers if customs clearances and similar formalities are taken care of by the distributor. It seems unlikely, therefore, that much economic activity is shifted across borders in either direction in response to the exercise of transfer-pricing opportunities in this area.

INTERCORPORATE LENDING AND INTEREST PAYMENTS

There is little doubt that intercorporate capital transactions have in many instances been structured to preserve flexibility and minimize prospective tax liability. To do so is in most cases perfectly legitimate; no taxpayer is under any obligation to manage his affairs in such a way as to maximize his tax liabilities. As we have noted, however, opportunities in this direction are multiplied when more than one government is involved.

One simple means of shifting the locus of tax liability on earnings of foreign affiliates is through the use of debt, rather than shares, for the financing of such ventures. Interest obligations on the debt may absorb all of the affiliate's operating income, leave it with no tax liabilities in the host country, and in effect move the income from the subsidiary to the parent or to another affiliate providing the financing, either in the home country or in a tax-haven jurisdiction. The latter may be used to postpone tax liabilities in the home country of the parent. An alternative use of financing by debt is to enable repatriation of an amount equal to the initial capital sum in the form of loan repayments, thus postponing dividend receipts and the tax liabilities associated with them. The subsidiary's earnings are used to retire indebtedness instead of paying dividends.

There are many reasons quite apart from tax considerations which may dictate the use of debt, rather than equity, in financing subsidiaries. Foreign exchange control systems are frequently more liberal with regard to making funds available for debt service than for dividend payments, and a financing structure which permits the early repatriation of capital at risk in politically volatile situa-

tions has obvious attractions from a risk-management point of view. Indeed, a company investing in such jurisdictions may well invest most of investment in the form of low-coupon bonds in the affiliate, purchased at a discount, which could enable recovery of more capital than was initially provided.

The general attitude of tax authorities has been to permit any transactions having a legitimate business purpose other than mere tax avoidance. Canada has found it necessary, however, to impose special restrictions on the use of thinly capitalized subsidiaries in this country. If indebtedness to the parent constitutes more than 75 per cent of the capital structure, interest payments may be disallowed (Income Tax Act, s. 18(4)). This does not really resolve the problem, since it seems possible to make the transaction through a financial intermediary, such as a bank, in which the advances to the subsidiary come from the latter under a collateral trust arrangement where the parent in effect puts up the money. No doubt more complex variations on this theme are possible too.

These transactions do not involve transfer pricing as such, though they have similar effects, at least on the revenue side. Pure transfer pricing in financial transactions occurs when loans are extended at rates above or below the market rate which would prevail if borrower and lender were dealing at arm's length. The appropriate rate is of course the rate which would be paid by the subsidiary. If the parent's credit is better than the subsidiary, flowing-through loans at cost to the parent in effect shifts income from the parent to the subsidiary.⁶ If an interest rate above the subsidiary's free market borrowing rate is charged, the effect is to shift income to the parent.

In preventing abuses in this area, Canadian tax authorities have an advantage over their US counterparts, in that interest expenses are not automatically deductible under the Income Tax Act but must be incurred for the purpose of earning income. This provision was used to disallow interest on sums borrowed by Canadian Safeway to lend to a subsidiary on an interest-free basis.⁷ The income transfer in this case was of course quite obvious because the loan was interest-free. It would be almost as obvious in a case in which monies were borrowed at 9 per cent and re-lent to the subsidiary at 7 per cent. Our suspicion, however, is that if the funds were re-lent at 9 per cent the transaction would have been upheld even if the appropriate arm's-length rate for the subsidiary in question were 12 per cent. And if the advances came from general corporate funds, some of which had been borrowed before at lower rates, such as 5 per cent, there would be nothing to prevent their lending at almost any rate, even if the current oppor-

6 An equivalent implicit transfer is provided when the parent guarantees the subsidiary's indebtedness to a third party without charging for the accommodation thus provided.

7 *Canada Safeway Limited v. M.N.R.* (1957) S.C.R. 717

tunity cost of debt to the parent, as evidenced by yields on outstanding bonds, were 9 per cent. Once again, the guiding rule would appear to be that no taxpayer is obliged to maximize profit merely for the benefit of the Ministry of National Revenue. Because of the complexity of the risk premium structure, term structure considerations, and complications arising out of coupon rate differences, there would appear to be serious difficulty in even determining when income shifting via incorporate debt-financing transactions is taking place, even more difficulty in convincing the Courts that it is taking place, and almost insuperable difficulty in showing that it is illegal, as long as the amounts involved are modest and no tax-haven jurisdiction is evident on the scene. Nor, given the availability of financial intermediaries as substitutes for the parent company, does there appear to be very much that could be done to stop it without interfering with perfectly proper transactions.

Fortunately, perhaps, this area is one in which, tax revenue consideration aside, the economic consequences of interest rate transfer pricing would appear to be almost non-existent. Companies are unlikely to shift production from economic to uneconomic locations simply to obtain the differences between tax rates on a fudged interest differential of 1 to 2 per cent on a fraction of the assets employed.

CONCLUSIONS

We have examined the possibilities for transfer-price manipulation on intracorporate payments for services, whether rendered or imaginary. The most important areas, in terms of potential real economic impact as opposed to mere tax avoidance, appear to be management fees and R and D payments. At least between Canada and the United States there are now stringent regulations with respect to what must be charged and what may be paid affecting transactions in either direction. These regulations have become a major priority in the enforcement process, at least since the inception of the US DISC program. Since required charges often exceed permissible deductions, the basic problem facing companies is not how to use these items to avoid taxation but how to prevent double taxation on them. If the enforcement effort continues such payments do not seem to pose a major problem. There is a basic inconsistency in allowing payment of R and D contributions to parents and then permitting royalty payments for the use of the resulting technology. There is perhaps room for concern over tax avoidance in the areas of royalties and interest charges, though flagrant abuses can be stopped under the 'reasonable in the circumstances' and 'sham' provision of the Act. A number of estimates of revenue losses through manipulation in these areas have appeared in the press and elsewhere. We do not believe there is

sufficient evidence on which to prepare such estimates on any meaningful basis. Obviously the total cannot exceed the total of such payments made by multinationals based abroad plus those not made by branches of Canadian multinationals, and it must realistically be viewed as a great deal less than this unknown amount. Revenue considerations aside, this appears to be an area in which production and or employment effects are negligible.

The regulations are fairly new, however, and we may expect to find some transfer of management functions into Canada, to avoid the double taxation which results when management fees are paid to foreign parents. The R and D/royalty problem could, and we suggest should, be resolved by forbidding payment of one or the other, unless it arises from a contract which provides for pooling royalties on a worldwide basis in proportion to R and D contributions.

8

Transfer pricing under alternative tax systems – the value-added tax

The value-added tax (VAT) is relatively unfamiliar to North American and, until recently, to English-speaking readers generally. It has now received some publicity as the major form of business taxation adopted within the European Economic Community and thus in the United Kingdom. Much of the commentary in this country has tended to dismiss VAT as an unnecessarily complex sales tax system, lacking the sales tax's administrative simplicity but sharing its allegedly undesirable regressive character (see, for example, Bossons, 1972).

We believe this view to be mistaken; VAT appears to have a number of attractive properties in the transfer-pricing context, which will be examined below. It should be viewed not as a substitute for the federal sales tax but as a substitute for corporate income taxes. This suggestion is bound to be controversial since there is a widespread belief (e.g. Lewis, 1972) that the burden of the corporate income tax is borne either by corporations themselves or by their shareholders. For an examination of a similar substitution in the United States see Dresch (1977).

In our view this belief is as erroneous as it is popular. There have been many studies of the incidence of corporate taxes over the years, mostly directed at the question of short-run shifting. While the conclusions are not unanimous, the bulk of the evidence (see the references in Lévesque, 1967) suggests that most of the tax burden is shifted forward even in the short run. In the long run, given the multiplicity of investment opportunities available in the marketplace, it seems clear that corporate equity securities must and do offer yields comparable on a risk-adjusted basis to yields on debt instruments, residential real property, and the like. They do so only if the pre-tax profit margin is expanded enough to take care of the corporate income tax. While a small proportion may be shifted back to labour or, more plausibly, to rents, most of the corporate income tax as now constituted is almost certainly shifted forward into product prices. If so,

then the corporate income tax is simply another sales tax levied at varying rates on goods and services produced in the corporate sector of the economy. The rates vary from product to product, in proportion to the equity capital-intensity of the production process and the financial structure of the producer. Replacing it with VAT would merely involve the substitution of one type of sales tax, with known and ascertainable rates, for another which has arbitrary, unknown, and possibly capricious rates. Given the possibility of zero rating, there is no reason to believe it would be as regressive as the present corporate income tax. It would of course be possible to use VAT to replace not only the corporate income tax but the federal sales tax as well, thus streamlining the tax-collecting machinery.

It is not our purpose here to make a case for or against VAT but rather to indicate the nature of the possibilities for transfer-pricing manipulation when VAT is substituted for a corporate income tax. We examine two cases in a two-country context. In one, both countries are assumed to employ VAT; in the other, one uses VAT while the other retains the conventional corporate income tax.

VAT is a relatively new system of taxation, first introduced in a limited scale in France in 1953-4 and adopted in a more general form by member countries of the EEC in 1968. Prior to the introduction of VAT, most of the European countries had so-called turnover taxes or cascade taxes. These were in effect, sales taxes levied on transactions at every stage in the production-distribution chain, rather than at a single level as in North American sales taxes or the former purchase tax in the United Kingdom. While effective enough as a revenue producer, turnover taxes created a variety of problems. It was virtually impossible to determine the tax component of the selling price on any individual product, which was dependent on nothing more rational than the number of times the product or its component parts had been sold along the way to the ultimate consumer. Incidence was therefore not only capricious but unknown and virtually unknowable. Secondly, existence of the tax encouraged vertical integration purely as a tax-avoidance device and tended to discourage the division of labour by creating a fiscal bias in favour of 'make' rather than 'buy' decisions.

VAT gets around the problem of cascading on tax duplication by the relatively simple device of requiring all traders to charge tax on their sales, at the same time permitting them to claim, as a credit against the tax thus payable, the tax they have already paid. The tax is thus proportional in the long run to the gross value added by the individual enterprise. A number of variations are possible within the VAT framework: exclusion, treatment of imports and exports, exemptions and zero rating, and treatment of goods purchased on capital account.

As presently structured VAT is readily adaptable to primary and secondary industries, to wholesale and retail trade, and to a substantial portion of the re-

maintaining service industries. It is less easily adaptable to certain financial services such as banking and insurance, which have therefore been excluded and are subject to special taxation in existing VAT systems. Certain public sector activities have also been excluded, such as health services in the United Kingdom.

VAT could be levied on a country-of-origin basis, in which exports are taxed but imports are not, or on a country-of-destination basis, in which imports are taxed and exports not, or on bases which exclude or include both. Including both creates double taxation on internationally traded items; excluding both lets some goods through the net entirely. Of the two internally consistent approaches, the EEC has adopted the country-of-destination approach, which implies that the tax burden imposed by a given country is borne by its residents. In our analysis below, retention of this feature is assumed.

An important distinction must be drawn between the effects of exemption and zero rating. Exempt enterprises are not required to levy tax against their sales, nor are they permitted to claim credits arising from taxes paid on their purchases. The selling price of their services will therefore include an implicit allowance for tax on purchased inputs. Exempt enterprises are thus excluded from the system and, as far as it is concerned, stand in the place of the consumer. The initial French system excluded retailers, for example, and there was a lengthy debate in the United Kingdom over whether farmers should be excluded and treated as exempt or included and zero rated. While exemption results in selling prices which incorporate an element of tax, zero rating effectively ensures that no tax, on any stage of the production process, enters the final product price. It does so by permitting producers of zero-rated commodities to deduct all VAT paid to suppliers. Any excess of tax paid to suppliers over that payable by customers is rebated to the seller by the tax authorities; if only zero-rated commodities are produced or sold, the entire tax paid on earlier production stages is rebated. Zero rating on certain necessities such as food is the principal device used to build a degree of progression into the incidence of the tax, although some systems, particularly that of France, employ a multiplicity of rates for this purpose and as a means of influencing the composition of consumer expenditures.

The effective tax base is dependent on the treatment of the tax paid on goods and services purchased on capital account. The simplest is to permit the deduction of such taxes when they are incurred, as is done in Britain. If sales to government are zero rated, the tax base is made to coincide with private sector expenditures minus investment, that is, with private consumption. The alternative is to defer deductibility, allowing VAT paid on capital goods to be recovered over a period of years. Doing so complicates administration but broadens the tax base. If the period of recovery is equivalent to economic life, the tax base is equivalent to private sector net domestic expenditure (consumption plus net in-

vestment plus imports minus exports). Our examples assume that immediate deduction is allowed but that the firm has no capital expenditures in the period under consideration.

Any scheme which envisages the replacement of the corporate income tax with VAT must cope with the problem created by the widespread use of small-scale private corporations as devices for tax postponement, tax splitting, or tax avoidance intended to circumvent high marginal rates of personal taxation. Some form of income taxation for such corporations would have to be retained, at least to the extent of a tax on undistributed profits. Details of such arrangements need not concern us here. The basic objective is to replace the second level or the double-taxation component of the present personal/corporate tax system with VAT, but to ensure that all income accruing to productive factors gets taxed once as income. For the publicly held corporation, no corporate income tax would be levied, but dividends and realized capital gains would be taxed at full personal rates, with deemed realization on death. Companies not qualifying for such treatment would be subject to undistributed profits tax as well as VAT.

One of the major impacts of the adoption of VAT would be a reduction in the cost of equity capital employed by corporations. Under the present system of corporate income taxation, the yield required to induce investment in equities must, in effect, be grossed up by the corporation to ensure earnings are high enough to cover it.¹ With no corporate income tax, grossing up would not be required. In systems involving complete double taxation, with corporate rates of approximately 50 per cent, for instance in the US system, equity capital costs would be approximately halved. In a fully integrated system, in which the corporate income tax was regarded as prepayment of personal income tax and allowed as a credit against personal tax payable, there would of course be no reduction. In a partially integrated system, such as the present Canadian one, in which a partial credit is allowed via the dividend tax credit mechanism, there would be a significant reduction, though not as large as in the United States.²

This would have two effects. One would be to reduce the present tax-induced bias in favour of debt financing. Since there are effective constraints on the

- 1 This is a description of the result, not the practice. In some areas of activity, such as regulated utilities, pricing practice involves a direct application of the procedure described. In others the same result is brought about in the long run by a more indirect process involving the market mechanism, in which investment for replacement or expansion is not uncertain unless prospective margins will provide the required return.
- 2 This assumes that required yields and risk compensation are equalized on an after-tax basis, so that the dividend tax credit operates to reduce the cost of equity capital to corporations below what it would be in the absence of the dividend tax credit.

amount of debt financing available and it is not possible to avoid the increase in equity costs by substituting debt, there would still be a net reduction in the cost of capital inputs into the production process even after the resultant equity-debt readjustment. This reduction would carry through in the long run into the choice of production technologies, resulting in the substitution of capital for labour and ultimately in an increase in the marginal product of labour and in the real wage, given the usual neoclassical assumptions regarding production functions and capital/labour ratios. Estimating the magnitudes of these changes is a formidable task well beyond the scope of the present study. It is in any event dependent, in the Canadian case, on the extent of equity capital imports that would be permitted under the Foreign Investment Review Act or other legislation. Given the differences in the tax systems and the resultant likelihood that US tax costs would be reduced more than Canadian ones, it is not clear that the marginal capital/labour ratio defining Canada's zone of comparative advantage vis-à-vis the United States would be altered materially if both countries adopted VAT simultaneously. However, both would likely enjoy expanded comparative advantage with respect to the common market countries already on VAT. Unilateral adoption of VAT would increase Canada's zone of comparative advantage over the United States unless and until the United States followed suit. In doing so, of course, Canada would 'domesticize' its tax burden and no longer shift portions of it to foreigners via the corporate tax.

Relative prices and price levels would adjust to reflect the new tax. In general, prices of capital-intensive products would fall relative to those of their labour-intensive counterparts. Consumer prices would reflect the 'wedge' between factor prices and the ultimate economic prices introduced by the tax.

From the transfer-pricing point of view, the most interesting feature of a VAT system is that, since tax liability is dependent on final product sales to domestic consumers, it is unaffected by any manipulation of transfer prices on intermediate products. And since no element of tax enters into input costs transfer-price manipulation cannot affect locational choice. Consider the following example. A product is made and sold by local wholly owned subsidiaries of a multinational in the United States and in Canada. Sales in the United States are ninety units, and ten units are sold in Canada. Of total unit costs, including normal profits, \$5.00 are assumed to be expended on operations which must be carried on in the United States, \$4.00 on operations which are carried on in Canada. A third group of operations, designated 'footloose,' is assumed to be centred as to location, but will cost \$1.00 if carried out in Canada, and \$1.05 if carried out in the United States. The question is whether there is any transfer-pricing arrangement which will make it profitable to shift the third set of operations to a US location, if VAT rates are assumed to be 10 per cent in the United States.

TABLE 5

Profits and VAT liabilities under alternative locational choices, transfers priced at economic cost

	US Co.	Can. Co.	Consolidated
<i>Footloose production located in Canada</i>			
Sales			
Domestic	900.00	100.00	1000.00
Exports	50.00	450.00	— ^a
Total	950.00	550.00	1000.00 ^a
Costs			
Domestic inputs	500.00	500.00	1000.00
Imports at cost	450.00	50.00	500.00
Exports (cr.)	50.00	450.00	500.00
Cost of Domestic sales	900.00	100.00	1000.00
Profits	0	0	0.00
VAT liability			
VAT on total sales	95.00	110.00	205.00
Less credit for zero-rated exports	5.00	90.00	95.00
Net VAT liability	90.00	20.00	110.00
<i>Footloose production located in United States</i>			
Sales			
Domestic	900.00	100.00	1000.00
Exports	60.50	360.00	— ^a
Total	960.50	460.00	1000.00 ^a
Costs			
Domestic inputs	605.00	400.00	1005.00
Imports at cost	360.00	60.50	420.50
Exports (cr.)	60.50	360.00	420.50
Cost of Domestic Sales	904.50	100.50	1005.00
Profits	(4.50)	(0.50)	(5.00)
VAT liability			
VAT on total sales	96.05	92.00	188.05
Less credit for zero-rated exports	6.05	72.00	78.05
Net VAT liability	90.00	20.00	110.00

^a Exports disappear on elimination of intercompany transactions.

TABLE 6

Profits and VAT tax liabilities under alternative transfer pricing policies, footloose operations in United States

	US Co.	Can. Co.	Consolidated
<i>Transfers underpriced by 50 per cent</i>			
Sales			
Domestic	900.00	100.00	1000.00
Exports	55.25	360.00	— ^a
Total	955.25	460.00	1000.00 ^a
Costs			
Domestic inputs	605.00	400.00	1005.00
Imports at cost	360.00	55.25	415.25
Exports (cr.)	55.25	360.00	415.25
Cost of domestic sales	909.75	95.25	1005.00
Profits (Loss)	(9.75)	4.75	(5.00)
VAT liability			
VAT on total sales	95.53	92.00	187.53
Less credit for zero-rated exports	5.53	72.00	77.53
Net VAT liability	90.00	20.00	110.00
<i>Transfers overpriced by 50 per cent</i>			
Sales			
Domestic	900.00	100.00	1000.00
Exports	65.75	360.00	— ^a
Total	965.75	460.00	1000.00 ^a
Costs			
Domestic inputs	605.00	400.00	1005.00
Imports at cost	360.00	65.75	425.75
Exports (cr.)	65.75	300.00	425.75
Cost of domestic sales	899.25	105.75	1005.00
Profits (Loss)	0.75	(5.75)	(5.00)
VAT liability			
VAT on total sales	96.58	92.00	188.58
Less credit for zero-rated exports	6.58	72.00	78.58
Net VAT liability	90.00	20.00	110.00

^a Exports disappear on elimination of intercompany transactions.

Table 5 shows the financial results if transfers are priced at cost (including normal profits). These assume that prices, exclusive of VAT, are held by competitors to the level dictated by the most efficient or least-cost sourcing decision, that is, with the third set of operations located in Canada. As might be expected, this shows that a loss of \$5.00 results from locating the footloose operations in the United States.

Table 6 shows the effects of arbitrarily reducing and/or increasing the transfer price on the output of the footloose activities carried on in the United States. As indicated, the locus of the loss is shifted, but the magnitude of the consolidated loss is unchanged, as is the ultimate VAT liability. The amount of VAT payable on imports, which is not shown separately, is altered by the decisions to under-price or overprice transfers, but, because this is merely a partial prepayment against the ultimate VAT liability, this is offset by an equivalent reduction or increase in the credit for VAT paid against VAT payable on sales.

VAT, then, is seen to be particularly immune from transfer-price manipulation. There are some opportunities for 'fiddles' where substantial monopoly power in either market permits price discrimination; for example, liability could be reduced by cutting domestic prices and over-pricing transfers into a monopolized export market. However, such discrimination or its reverse (dumping) seems as likely to occur in the absence of VAT and can hardly be viewed as tax-induced.³

It remains to consider the effect of VAT in conjunction with other types of tax. We have noted that the existence of import duties provides an incentive to manipulate transfer prices, an incentive to some degree offset by another, to manipulate them in the opposite direction, provided by the corporate income tax. With the latter replaced by VAT, its countervailing effects would be lost, and the incentive to manipulate transfer prices to evade import duties would operate unchecked. Because of this, there would appear to be a natural affinity between VAT and free trade systems, even limited ones such as the EEC. Most of the supposed general advantages of Canadian tariff protection could in our view be retained if a free trade system with an appropriate exchange rate adjustment were substituted in its place. This, however, is not the place to embark on a detailed examination of tariff policy. The observation is only made to note, first, that incentives to manipulate transfer prices would disappear under such a regime combined with VAT and, secondly, that such manipulation as would take

3 Optimum discrimination requires the equating of marginal costs with the marginal revenues in individual markets having different demand elasticities. Imposition of VAT, or different rates of VAT in different markets, will of course affect the optimum pattern of discrimination, since marginal revenues are affected. As costs are unaffected, however, there will be no direct locational impact.

place under a VAT-plus-tariff system would tend to produce a result closer to such a solution than the tariff rates themselves would suggest.

A more immediate practical question concerns systems in which VAT operates in one country and the corporate income tax in its trading partner(s). Such a combination could exist if Canada adopted VAT and the United States did not and is in fact approximated by European-North American trade, given the importance of VAT in the EEC and the relatively low effective rates of net corporate income tax in many EEC countries. The immediate effects of the implementation of such a system, in place of systems using similar corporate income taxes, are to reduce the cost of capital to producers in the VAT area, to increase the range of capital intensities in which they have comparative advantage, and to create an absolute cost advantage for the VAT countries which will sooner or later have to be compensated for by an exchange rate adjustment. There will be an incentive to shift certain activities into VAT countries and manipulate transfer prices to ensure that as much profit is earned in such countries as possible. If this sounds like a scenario describing US-European trade relations since the adoption of VAT by the EEC, it is not purely coincidental, though other factors, in addition to tax differences, have been operative.

To some degree, of course, the country retaining the corporate income tax can protect itself, as far as such activities on the part of its own multinationals are concerned, by adopting a world-wide income tax base and taxing foreign profits as they are earned rather than as they are repatriated; recent US changes in the tax treatment of multinationals are a step in this direction. In the long run, however, doing so simply erodes the competitive position of domestically based multinationals and invites their replacement by (or conversion to) foreign-based multinationals whose ability to move capital and profits is less inhibited.

9

Conclusions and policy recommendations on transfer pricing

Our principal conclusion is that multinationals have a relatively restricted scope for transfer price manipulation. This result stems in large measure from the fact that tax systems and tariff systems provide incentives for transfer-price manipulation which tend to be mutually offsetting.

There are two precise tests of this statement based on the two-sector-firm pseudo-empirical model discussed in chapter 5 and reported in detail in appendices A and B. The first and simpler one is that the distributions of profit-maximizing locations for independent firms and multinationals in the presence of taxes and tariffs be approximately the same. From Tables B.5 and B.6, estimates of the variances of the locational distributions are 336 for independent firms and 345 for multinational firms over *all* tax and tariff parameters examined. This leads to an F-statistic of 1.03, sufficiently close to 1 that rejection of the null hypothesis of equal variances appears unlikely. Therefore, the distributions of independent and multinational locations in the presence of taxes and tariffs appear to be similar.

The second test of our result is that the multinational locational pattern with taxes and tariffs simultaneously imposed is more like the free-trade-no-tax world than either the pure-tax or pure-tariff pattern. This holds interest if we believe that the free-trade-no-tax world represents an efficient allocation of resources. To facilitate this comparison, we look at Scenario 4 against Scenario 1 in Table B.6. A casual glance confirms that the two distributions are not identical, but the important point to recognize is the (not perfectly) offsetting tendencies of the two fiscal instruments. This effect may be expressed in terms of the correlation coefficient between tax policy and tariff policy when both are simultaneously in effect. For all the tax and tariff scenarios, the appropriate correlation coefficient is -0.55. For selected scenarios, the coefficient ranges from a low of

-0.18 to a high of -0.78.¹ The significant fact is the negativity of the statistic; the greater it is in absolute terms, the greater is the offsetting effect of the two policies. The variation in the measure arises because the offsetting nature of the two fiscal instruments is *not* independent of the actual tax and tariff rates applied in the two countries.

This result has important policy implications but needs to be qualified. We discuss the policy implications first. This result suggests that abuse is more apt to be prevalent in transactions in which the 'self-policing' element introduced by offsetting incentives in the tax and tariff system is absent. There are several examples of this. One such group of transactions has already been identified in the corporate services area, discussed in chapter 7. At least on this ground there is reason to believe that some of the concern over transactions in that area is well founded, or at least better founded than concern over transfer pricing of many physical commodities. While the primary effects are revenue effects, rather than distortion of production and output decisions, it may be desirable to create a system of countervailing incentives to curb exploitation of this potential revenue drain. The application of a tariff is impractical, since there is no physical movement of goods. Withholding taxes applied to such payments would provide the fiscal equivalent of a tariff, except that they are eligible for tax credit treatment in some countries, including the United States. If assessed at appropriate rates, however, they would recapture the revenue losses. However, our calculations suggest that recapture will only be partial if the withholding tax rate is equal to the Canadian tax rate, and if pressures are being applied by foreign jurisdictions to shift tax liabilities in this fashion there will be revenue losses until this point is reached. The example in Table 7, which assumes a Canadian tax rate of 52.3 per cent and a foreign tax rate of 48 per cent applied to income which is not being remitted and withholding taxes of 20 and 52.3 per cent applied to a management fee of \$1,000, illustrates this point.² In this example, there is an incentive to assess the management fee against the Canadian subsidiary, but the revenue

- 1 -0.18 is the correlation coefficient between the tax and tariff effect for a US corporate tax rate of 51 per cent, a Canadian corporate tax rate of 46 per cent, a tariff of 10 per cent on semi-finished products and a tariff of 15 per cent on finished goods; -0.78 is the correlation coefficient between the tax and tariff effect for a US corporate tax rate of 46 per cent, a Canadian corporate tax rate of 46 per cent, a tariff of 10 per cent on semi-finished products and a tariff of 15 per cent on finished goods.
- 2 The example assumes that the withholding tax on the management fee is eligible for tax credit treatment and that other foreign income is large enough and so structured as to permit utilization of the full potential tax credits. If tax credit may be applied only up to the limit of the foreign tax payable, that is a net disincentive to apply the management fee in the first place.

TABLE 7

Cost and revenue effects of applying withholding taxes to management fees

	No withholding	20% withholding	With 52.3% withholding
Management fee	\$1,000	\$1,000	\$1,000
Canadian income tax	(523)	(523)	(523)
Withholding	0	200	523
Foreign income tax	480	480	480
Tax credit	—	(200)	523
Tax effect on company	(43)	(43)	(43)
Effect on Canadian tax receipts	(523)	(323)	(0)
Effect on foreign tax receipts	480	280	(43)

consequences for Canada are eliminated by the high rate of withholding tax. A 52.3 per cent withholding tax is of course similar in effect to disallowing the deduction of such payments in determining Canadian tax liability, except that the latter requires repatriation of earnings to obtain the tax credit available in the foreign country.

It is because of the availability of the tax credit that the withholding tax mechanism differs from a tariff. The effect of a 20 per cent tariff on the same transaction would be to discourage it, as follows:

	Without tariff or withholding (\$)	With tariff of 20% (\$)
Management fee	1,000	1,000
Tariff	—	200
Cost to Canadian subsidiary	1,000	1,200
Canadian income tax	(523)	(627.60)
Foreign parent receipts	1,000	1,000
Foreign tax	480	480
Net tax consequences	(43)	52.40

The incentive disappears at any tariff rate in excess of 9.0 per cent at the tax rates used in the example.³

3 The tariff rate d_c required to neutralize a given pair of tax rates t_c, t_f is given by $(1 - t_c) d_c = t_c - t_f$.

Another example of a setting ripe for potential abuse arises in the case of commodities which move free of duty at low ad valorem rates or under specific duties. In all these cases, there is an incentive to overprice imports into, and underprice exports from, the high-tax-rate jurisdiction.

Many raw material products of agricultural, forest, or mineral origin are accorded a duty-free or low-tariff rate under the Canadian customs tariff as well as under the customs tariffs of our major trading partners. Duties, where levied, are frequently at specific rates (i.e. per ton or per gallon) which do not generate the countervailing incentives of ad valorem duties. Accordingly, this group of commodities must be regarded as unusually prominent candidates for transfer price manipulation.

Of course it takes more than an appropriate set of tax rates to generate transfer price manipulation. Where commodities move freely in transactions between unrelated companies at prices which are published or otherwise easily accessible, if only by comparison with those received by the taxpayer and others on arm's-length transactions, the opportunities for manipulation would seem to be at a minimum. Most agricultural exports can be dismissed as possibilities for this kind of manipulation, since sales are generally at arm's length.

Can we identify industries in Canada which appear to be candidates for transfer price manipulation by their current transfer pricing practices? Crude petroleum produced in Canada is sold at posted prices which are the same (apart from the export tax) for foreign as well as for domestic buyers. Natural gas moves into export channels as the property of pipeline companies. Two of these are unrelated to foreign buyers, but one is an affiliate of Pacific Gas and Electric Co. and a fourth is a subsidiary of a utility company in Montana. Field prices for gas, however, are effectively controlled by the producing provinces, and the pipelines themselves are subject to utility-type controls in a variety of jurisdictions which preclude any serious manipulation of transfer prices. There has been concern over the border price of natural gas and over price discrimination in favour of American buyers, but the transactions were arm's-length ones in which the discrimination was induced by the combined monoposony power of the US buyer and the Federal Power Commission. (Canada, Royal Commission on Energy, 1958). Coal exports in many instances involve shipments from Canadian subsidiaries or affiliates to overseas (usually Japanese) parents. Until quite recently the problem was one of getting not an arm's-length price but any price at all. Coal differs from oil (but not from natural gas) in being sold under long-term contracts, a practice arising in part from the way in which mine development and transportation facilities are financed. While sales under individual contracts may differ from current 'spot' prices, this hardly constitutes transfer price manipulation, and in a number of instances prices have been adjusted upwards since 1973

to reflect current conditions. There would appear to be enough leverage in provincial legislation to prevent any serious manipulation here.

Metals and ores are another major group of exports for which the fiscal preconditions for transfer pricing exist. Metals themselves, however, tend to be sold at prices which are publicly available, for instance the North American Producer Price or the London Metal Exchange spot price in the case of base metals, and do not appear to constitute a problem area for transfer pricing. A problem does appear when ores rather than metals are exported for processing abroad. Payment, whether in arm's-length or parent-subsidiary transactions, is usually based on the prevailing metal price, less a processing charge or 'toll.' Since refining processes are not standardized there is no readily ascertainable market processing charge except in the case of custom smelters which accept ore from a variety of unaffiliated shippers. As a consequence there is some scope for discretionary pricing of processing charges. In a well publicized incident in 1974 the Ontario government introduced legislation which would prohibit the deduction of processing charges on Ontario ores processed abroad. This was widely interpreted as an attempt to force domestic processing of ores, but may have been a measure to force an amendment of processing charges levied on a leading copper-nickel producer by its Norwegian subsidiary. The matter appears to have been resolved and the legislation modified as the result of intensive negotiation between the government and the company in question.

Ownership patterns and product flows in the forest products industry, particularly in pulp and paper, suggest that this industry is the most likely candidate among primary producers to be a source of transfer pricing problems. Multinationals are more prevalent than in the mining industry; there are major international movements of unfinished products such as pulp; and even finished products tend to move across the border to affiliated sales organizations rather than to arm's-length buyers. An extreme example of the extent to which transfer prices must be established is a mill complex straddling Sault Ste Marie, Ontario, and Sault Ste Marie, Michigan, in which intermediate products cross the border a number of times in the course of an integrated manufacturing process.

Products in the industry are for the most part standardized, and published price quotations exist, even for certain intermediate products. However, list prices are often only a starting point at which negotiations begin rather than the end point at which transactions take place. Selling prices on many sales to corporate parents which are end-users, for instance the case of newsprint, are influenced by the existence of long-term contracts which guarantee a market to the mill. Long-term security of outlets is worth a great deal in an industry which has been plagued by chronic excess capacity, but the precise degree to which discounts should be provided is difficult to evaluate. Even when the foreign buyer

is a sales affiliate of the producer, the package of marketing services provided is apt to be more comprehensive than that provided by independent selling agents, making the comparison of discounts tenuous.

However, as in the other cases involving primary products exporters in which transfer pricing problems are likely to arise, the number of companies involved here is small (a few dozen at most) and the types of suspect transactions clearly identifiable. A direct approach to enforcement can be taken using specialized assessors, and there is no reason to believe that manipulation beyond the boundaries defined by the Income Tax Act is a serious problem.

With imports of low-duty primary products, the problem is similar. The significant primary products imported are: products of tropical or semi-tropical agriculture, coal, crude petroleum, and a few other minerals such as bauxite. Multinationals are involved in all these trades with the exception of coal. Posted prices for crude petroleum in the offshore market have been much less reliable than their domestic counterparts, and a similar lack of reliable market price information exists in the case of bauxite. The zone of uncertainty surrounding market prices is not large but appears in some cases to have been large enough to accommodate affiliated middlemen, either marketing agencies or agencies between producers and importers, which may have diverted some profits into low-tax jurisdictions. In view of the well-directed enforcement efforts, it is unlikely that manipulation has gone beyond the bounds permitted by the Income Tax Act, although these are undoubtedly borderline cases.

Another potential area for manipulation arises because of special duty-free status with parts and finished commodities, such as auto parts moving under the special free trade accorded by the Canada-US auto pact. Because of the multiplicity of products involved and the absence of independent markets for many of them, this is probably a more difficult area to police than primary products. Where prices can be checked, such as on finished automobiles, there are price differentials, net of manufacturers sales taxes, which appear to reflect systematic price discrimination against the Canadian market and for which no satisfactory explanation has ever been provided. This situation is further complicated by the market power possessed by the automobile producers and by the limited access to duty-free status provided in the agreement.

As a plausible explanation for the differentials we note that Canadian-made products must be priced in the United States at levels which make them competitive with US-produced models, which include a tax component lower than that in Canada. Similarly, US models sold in Canada need only be competitive with Canadian-made models and may be priced on a basis which includes a higher implicit tax component. The combined effect of discrimination and transfer pricing may be to impose the higher tax costs of producing cars in Canada

on Canadian consumers. This proposition is necessarily conjectural, but it appears to fit the observed facts and explain them.

This tax and tariff effect has still one further policy implication. A number of agencies in Canada, including the C.D. Howe Institute and the Economic Council of Canada, have suggested negotiating reciprocal free trade agreements or even a unilateral move to free trade. Given the offsetting nature of taxes and tariffs, this could result in a magnification of transfer pricing problems since it would remove the major self-correcting mechanism in the present system. This does not necessarily imply there would be no benefits from such a move, but simply that perceived benefits would be reduced by revenue losses and production losses resulting from transfer pricing, or by the need to divert resources into tax enforcement, or, most probably, by both. The problem is that a corporate tax system of the North American type at present tax rates and in the absence of tariffs produces strong incentives to manipulate transfer prices in a free-trade context to minimize tax payments. If free trade is to be contemplated seriously, it should, in our view, be accompanied by changes in the fiscal system which would remove, or at least weaken, incentives to manipulate transfer prices.

The experience of the EEC is not an altogether reliable guide in this matter. Concern over transfer pricing has grown in the EEC countries and steps have been taken to bring it under control. However it should be noted that European fiscal systems rely much less heavily on corporate income taxes of the North American variety. Where such taxes exist their nominal rates are usually lower than those in North America. Because of more liberal depreciation provisions and so on, effective rates are lower still. The backbone of the business tax system in the EEC is the value-added tax, which in the form adopted contains few incentives to manipulate transfer prices. It is likely that a similar alteration in the tax system in Canada should be a part of any free-trade arrangement undertaken.

There are several important qualifications to our principal result. While the extent and effect of transfer pricing manipulation may well be less than is feared by some of the more vocal critics of multinational enterprises, and in some cases may be so small that the damage inflicted in the Canadian economy is negligible, there appears to be no conclusive proof in this area. At best, our pseudo-empirical technique is representative of a world where more complete measurement of the magnitudes appears to be impossible. Even if such proof could be produced, it would not, in our view, justify an altogether complacent attitude toward the problem.

Our pseudo-empirical results indicate that although tax and tariff practises are offsetting, they are not perfectly offsetting in their effect on multinationals, for although independents and multinational locational distributions are similar they

are not identical. Thus, possibilities exist for transfer price manipulation depending upon the actual tax and tariff rates and rules and the precise nature of production. To the extent that such manipulation is pursued or can be pursued, it results in reduced tax and/or tariff receipts, weakens the effectiveness of the tax and tariff system as an economic policy instrument, reduces employment of domestic labour and capital, and encourages the conversion of Canadian domestic firms into branches of multinational organizations.⁴ While some may regard the frustration of certain aspects of domestic economic policy with approval, they can scarcely applaud the selective nature of an avoidance mechanism which gives most of the benefits to foreign multinationals. None of the other consequences seem particularly desirable either, so it would appear that active measures to limit and, if possible, reduce the extent of transfer price manipulation are desirable. Such measures would appear to be of two types: enforcement of existing legislation and changes in the law.

As noted earlier, existing tax and tariff legislation contains provisions intended to prevent transfer price manipulation. To the extent that firms operate within these limits their freedom in this regard is severely limited. While these or equivalent provisions have been on the statute books for years, there is some evidence that overt enforcement was, until the last decade or so, less vigorous than it is today. The statutory provisions themselves seem draconian, particularly those in the Income Tax Act. The extent to which the possibility of their application has altered the behaviour of would-be offenders is unknown, but it is probable that the very harshness of the provisions themselves has made their application a matter of last resort rather than of routine. It has also, we suspect, made the judiciary reluctant to apply these sections except in cases of blatant abuse.

In practice this means a broad penumbra of discretion is available to companies in intracorporate pricing. More than one price is likely to qualify as 'reasonable in the circumstances.' Since enforcement must be based, for reasons of administrative feasibility, on accounting measurements which are inherently imprecise, it would seem impossible to do much more to narrow this range of discretion. The extreme provisions of s. 245(1) are probably necessary as a backstop and as a means of encouraging 'voluntary' compliance when other measures fail, but their very existence probably widens the area of discretion because of the propensity of appellate bodies to give the taxpayer the benefit of the doubt.

There are, therefore, real limits to what can be achieved through more intensive enforcement efforts. This does not mean we are at, or even near, those limits. The benefits from stricter enforcement include not only the additional tax revenue realized in the immediate instance but also the flow of future tax rev-

4 The multinationals may be of Canadian domicile, but most are not.

enue resulting from amended transfer pricing practices and indirect benefits which result from the resulting reduction in 'slippage' in the operation of other economic policy instruments.⁵ An optimal enforcement effort in this area will be one in which enforcement budgets extend well beyond the point where incremental revenues from revised assessments, penalties, and the like cover incremental enforcement costs. However, the fact that there are limits means that we cannot look solely to enforcement to correct problems in this area but should consider structural changes which will reduce incentives to manipulate, eliminate them entirely, or simplify enforcement.

5 We must assume here that operation of these instruments is in fact beneficial in their operation; but the possibility that economic policy measures of harmful character are adopted as political 'window-dressing' but not enforced, in the hope that they will be systematically evaded to such a degree as to render them harmless, must be recognized.

A multinational firm model of transfer pricing

INTRODUCTION

In this appendix our objective is to analyse the impact on multinational firms of arbitrary valuations by tax and tariff authorities of the prices of factor inputs and semifinished goods. In comparison with independent firms where trade occurs at known prices established in markets, such valuations may cause transfer prices to be chosen which deviate from competitive market prices and alter the pattern of production that would occur in a competitive setting. In addition, arbitrary valuations of semifinished goods for tax purposes that deviate from market prices and depreciation measures of capital goods that deviate from user prices cause distortions in the least-cost selection of inputs and may alter the choice of production location.

To facilitate this analysis, we construct a simple, static, two-sector model of a firm where a border may exist between the sectors of the firm. We assume that the initial sector of the firm produces a semifinished commodity X , using labour and capital services according to a linear homogeneous production process described by the production function

$$X = X(K, L). \quad (\text{A.1})$$

In turn, X is utilized together with labour and capital services in a weakly-separable linear homogeneous production process to produce a final output Q , described as the final product production function

$$Q = Q(I(K, L), X). \quad (\text{A.2})$$

X and/or Q could be produced in either of two regions which have different tax

authorities and rules, with the possibility of tariffs on flows of commodities across the border separating the two regions. Although multiregion, multicommodity models may be more appealing because of their generality, their mathematical complexity tends to obscure economic interpretation and comprehensibility. Consequently, our model is restricted to two regions. The tax and tariff practices examined in this appendix are those of Canada and the United States; therefore we index our regions as c and u respectively.

Linear homogeneity of the production processes is assumed throughout. With linear homogeneity in production, cost-minimizing firms produce X and/or Q exclusively in one region, a result consistent with the observed behaviour of many firms, as amended by transportation costs. Linear homogeneous production functions imply competitive market behaviour. Thus firms in our model are atomistic price-takers.

This assumption is consistent with our view that where multinationals dominate independent firms with markets they do so because they represent a cheaper method of monitoring and co-ordinating productive inputs (in the sense of Alchian and Demsetz, 1972), not because of significant internal economies of scale. In addition, linear homogeneous production functions have analytical properties that make them convenient.

Our production processes have certain elements of separability. First, separability of outputs, so that each production function is a one-output production function, is largely a matter of convenience for cost calculations.¹ Second, weak separability of inputs in the production function yields a corresponding weak separability in prices in the final cost function, a convenient property for cost calculations. This type of separability is tantamount to the assertion that the marginal rate of technical substitution between capital services and labour in the second stage of the production process is independent of the amount of the semifinished good X used in the production of the final good Q . At the aggregate level, such separability in production does not appear to have empirical support (see for example Denny and May, 1978; Burgess, 1976). At the firm or plant levels there is little empirical work to test for the appropriateness of these separability assumptions. One exception is the study by Griliches and Ringstad (1971), which estimates a production function using Norwegian plant data similar to (A.2) but imposes stronger separability of the value-added type, that is, $Q - X = I(K, L)$. No tests were undertaken by Griliches and Ringstad of the

1 Accompanying multiple output production processes is the difficulty of allocating joint costs for cost calculations.

suitability of this strong form of separability as opposed to other weaker forms.

Our model is a partial equilibrium model. We assume that each firm can buy as much or as little of the factor inputs as it wants at existing regional prices. We assume that capital and labour are immobile.² We assume perfect knowledge on productive techniques in the two regions. Finally, we assume parity in exchange rates between the two regions. As our ultimate interest lies in evaluating the impact of arbitrary tax and custom valuation rules on the behaviour of the multinational firm, these assumptions seem reasonable. The suitability of our production specifications could be tested and optimal transfer prices and corresponding costs could be calculated only with access to the appropriate plant or firm level data, which are simply not available. Given this restriction, we must resort to the methodologically weaker but feasible procedure of evaluating costs and transfer prices for a reasonable production structure under a number of alternative scenarios concerning tax and custom valuation rules across a number of cases involving jurisdictions of production.

This requires a focus on costs and the assertion that in a given scenario for any organization of production it pays the profit-maximizing firm to select that jurisdictional or locational alternative that minimizes costs. There are a number of known theorems on the properties of cost functions which we use throughout the analysis. It is convenient for us to state them at this point.

PROPOSITION 1: If a production function $Y = f(X_1, \dots, X_N)$, where Y is a maximal scalar output and $X = (X_1, \dots, X_N)$ is an N -dimensional vector of inputs, is positive, linear homogeneous, and quasi-concave, then and only then the corresponding cost function $C(Y; p) = C(p) \cdot Y$, where $p = (p_1, \dots, p_N)$ is the corresponding N -dimensional vector of input prices, has a unit cost function $C(p)$ which is positive, linear homogeneous, and quasi-concave (Diewert, 1974).

PROPOSITION 2: If the set of inputs X is partitioned into R mutually exclusive and exhaustive subsets, then under linear homogeneity the unit cost function $C(p)$ is weakly separable with respect to the partition R in input prices if and only if $f(X)$ is weakly separable with respect to the partition R (Berndt and Christensen, 1973).

Propositions 1 and 2 permit us to move from our assumptions about the production functions (1) and (2) to equivalent corresponding cost functions. If

2 Obviously with factor mobility any factor price differentials would disappear and least-cost locational decisions in our model would involve only relative taxes and tariffs. Even with equal prices for mobile factors, in fact, there may be other factors not included in our model accounting for absolute advantage in particular regions, such as the existence of a scarce natural resource.

we denote the economic cost of labour and capital services in each region respectively by w_i , and r_i and the price per unit of X_i as g_i , $i = (c, u)$ then the cost functions corresponding to (A.1) and (A.2) may be written as

$$C_X^i = C_X(w_i, r_i) X, \quad (\text{A.3})$$

$$C_Q^i = C_Q(C_I(w_i, r_i), g_i) \cdot Q, \quad (\text{A.4})$$

where $C_X(w_i, r_i)$ and $C_Q(C_I(w_i, r_i), g_i)$ are the respective unit costs of X and Q , depending on the production region.

In general, tax and tariff practices tend to alter the set of prices (w_i, r_i, g_i) , $i = c, u$. Whether or not these practices in any one region alter the selection of the least-cost jurisdiction depends on the relative factor prices in the cost region, the share of labour and capital in the production process, and the elasticity of substitution between labour and capital in each of the production stages. Given the number of regions, there are four locational possibilities for each of our tax/tariff scenarios: $X(u) Q(u)$, $X(u) Q(c)$, $X(c) Q(u)$, and $X(c) Q(c)$, where $X(i) Q(j)$ indicates the region where X and Q are produced.

To facilitate this analysis, we use a constant elasticity of substitution (CES) production specification for each of the production stages.³ By appropriate selection of the input units, CES analogues for (A.1) and (A.2) are:

$$X_i = [a_X K_i^{-\rho_X} + (1-a_X) L_i^{-\rho_X}]^{-1/\rho_X}, \quad (\text{A.5})$$

$$I_i = [a_I K_i^{-\rho_I} + (1-a_I) L_i^{-\rho_I}]^{-1/\rho_I}, \quad (\text{A.6})$$

$$Q_i = [a_Q I_i^{-\rho_Q} + (1-a_Q) X_j^{-\rho_Q}]^{-1/\rho_Q}, \quad (\text{A.7})$$

where $i, j = c, u$, (a_X, a_I, a_Q) are distribution parameters, and (ρ_X, ρ_I, ρ_Q) are substitution parameters. Finally, $\sigma_k \equiv 1/(1 + \rho_k)$, where σ_k is the Allen elasticity of substitution for production stage ($k = X, I, Q$).

It is possible to define corresponding cost functions for (A.5), (A.6), and (A.7). As these production functions have the properties defined in Propositions 1 and 2, their corresponding cost functions also have the properties defined

3 There are more general functional forms for production functions than CES (see Hanoch, 1975). However, with differences in the relative factor prices across regions, the important production parameters for our purposes are capital and labour intensities and factor substitutability. These are most easily captured in the CES specification.

there. For numerical purposes we calculate unit costs associated with each of the four cases for location of the productive activity for several scenarios on taxes and tariffs for production activities specified by the separable CES production functions (A.5), (A.6), and (A.7).

TAX AND TARIFF SCENARIOS

Taxes and tariffs with no constraints

We now turn to a description of each of these tax/tariff scenarios. For analytical purposes, we continue to use the general cost function notation of (A.3) and (A.4). There are four basic scenarios on taxes and tariffs with several qualifications within each. Table A.1 specifies each of these. For each scenario, we calculate unit costs to independent and multinational firms. When production of both X and Q takes place within one region, these unit costs should be the same for independents and multinationals. When production of X and Q takes place in separate regions, these unit costs are not equal to the extent that arbitrary customs valuations do not equal the market prices that would prevail if markets existed.

Define R as the revenues from the sale of Q . Then, in Scenario 1, profits for the two respective sectors of the firm may be written as

$$\Pi_i^X = g \cdot X - r_i K - w_i L, \quad (A.8)$$

$$\Pi_j^Q = R_j - C_I \cdot I - g \cdot X, \quad i, j = c, u, \quad (A.9)$$

with production defined by (A.1) and (A.2), $C_I \equiv C_I(w_j, r_j)$, an aggregator function over the prices of the two factors weakly separable in the production of Q , and R_j defined as gross revenues from the sale of the final product in region j .

Obviously in this free-trade, no-tax setting, with identical linear homogeneous production functions across the regions, different relative factor prices dictate that all of each commodity is produced exclusively in the least-cost region. Under these assumptions the same conclusion holds independently of weak separability in inputs and no matter how many commodities or regions exist in the model.

Solutions to Scenarios 4a, 4b, and 4c are the most complex in the sense that they represent both taxes and tariffs. The solutions to these scenarios yield solutions to their counterparts in Scenarios 2 and 3 simply by setting tariff or tax rates equal to zero. Therefore, we concentrate on developing the more complex models with tariffs and taxes. By setting the appropriate tariff or tax parameter to zero, we may easily generate solutions in the absence of tariffs or

TABLE A.1

Tax and tariff scenarios for firms

Scenario	Description
1	no taxes, free trade
2	no taxes, customs duties, market prices (independent firms)
2a	no taxes, custom duties, no constraints on transfer pricing, multinational firms
2b	no taxes, arbitrary customs valuation rates on markups of type found in Canadian Customs Tariff Act, multinational firms
3	taxes, free trade, market prices (independent firms)
3a	taxes, free trade, no constraints on transfer pricing, multinational firms
3b	taxes, free trade, US tax credit, multinational firms
3c	taxes, free trade, no US tax credit, profit margin constraint in US (<i>Eli Lilly</i> rule), multinational firms
3d	taxes, free trade, no US tax credit, cost markup transfer price rules used by Canadian Income Tax Act, multinational firms
4	taxes and customs duties, market prices (independent firms)
4a	taxes, customs duties, no constraints on transfer pricing, multinational firms
4b	taxes, customs duties, US tax credit, multinational firms
4c	taxes, customs duties, no US tax credit, profit margin constraint in US (<i>Eli Lilly</i> rule), multinational firms
4d	taxes, customs duties, no US tax credit, cost markup transfer price rules used by Canadian Income Tax Act, multinational firms

taxes. To facilitate these models, define t_i as the constant tax on profits in region i ; define r_i^* as the price of capital services allowed for tax calculations in region i , define τ_{ij}^Q and τ_{ij}^X as the per-unit tariff on Q and X respectively passing from region j to region i and levied on either a fair market price where one exists or an arbitrary valuation, 'reasonable under the circumstances,' where one does not exist. Then, in the presence of taxes and tariffs with no constraints on transfer pricing, production in separate regions, and using Propositions 1 and 2, profits for each sector of the multinational firm may be defined as:

$$\Pi_i^X \equiv g \cdot X(1-t_i) - C_X(w_i(1-t_i), r_i-t_i r_i^*) \cdot X, \quad (\text{A.10})$$

$$\Pi_j^Q \equiv (R_j - g(1 + \tau_{ji}^X) X - w_j L_j) (1-t_j) - (r_j - t_j r_j^*) K_j. \quad (\text{A.11})$$

Profits for the firm are (under parity in exchange rates)

$$\begin{aligned}\Pi \equiv & (R_j - w_j L_j) (1 - t_j) - (r_j - t_j r_j^*) K_j - C_X(w_i(1 - t_i), r_i - t_i r_i^*) X \\ & - g[(t_i - t_j)X + \tau_{ji}^X (1 - t_j)]. \quad (\text{A.12})\end{aligned}$$

Save for the distinction between r_j and r_j^* , equation (A.12) is identical to equation (5) in Horst (1971). Following Horst, if we define $T \equiv (t_i - t_j) / (1 - t_j)$, we may write equation (A.12) as

$$\begin{aligned}\Pi \equiv & (R_j - w_j L_j) (1 - t_j) - (r_j - t_j r_j^*) K_j \\ & - C_X(w_i(1 - t_i), r_i - t_i r_i^*) \cdot X - g(1 - t_j) [T + \tau_{ji}^X] X.\end{aligned}$$

Our interpretation differs slightly from Horst's. For $T > 0$, the firm would want to set g as small as possible. If there is no loss carried over, g is bounded below by $g'(L_i, K_i)$, where g' is such that $g'X - w_i L_i - r_i^* K_i = 0$. In this case, reducing g below g' would not improve after-tax profits on X in region i and would only reduce profits on Q in region j . For T sufficiently negative that $T + \tau_{ji}^X < 0$, the firm would want to set g as large as possible. Again, in the absence of any loss carried over, g is bounded above by $g''(X, L_j, K_j, \tau_{ji}^X)$ where g'' is such that $R_j - g''(1 + \tau_{ji}^X)X - w_j L_j - r_j^* K_j = 0$. In this case, increasing g and g'' would not improve after-tax profits in Q in region j and would only reduce profits on X in region i .

The absence of tariffs $\tau_{ji}^X = 0$ or taxes $t_i = t_j = 0$ alters the determination of the bounds of g but not the qualitative argument that g should be set at one of its feasible extremal points. Other inputs in this model for given output levels are set in the usual fashion so that their marginal products equal their factor prices and the firm chooses the least-cost case of production locations over the four jurisdictional alternatives. In this setting it is possible to conclude analytically that transfer prices have no impact on the least-cost selection of jurisdictions for production under the assumptions of the model.

Taxes and tariffs – the Eli Lilly rule

Another constrained solution is produced by the rule implicit in US tax legislation that transfer prices must be such that gross margins from the domestic operation of US firms must be at least as great as gross margins from foreign operations, called the *Eli Lilly* rule. To analyse this setting we need to restrict our attention to those cases where a border separates the sectors of the firm and distinguish between the case where the semifinished good is produced in the United States ($X(u), Q(c)$) and the case where the final commodity is produced there ($X(c), Q(u)$).

First, consider a multinational firm producing the semifinished commodity X in the United States and the final commodity Q in Canada. Define η to be the transfer price consistent with the *Eli Lilly* rule. Define $C_X(r_u^*, w_u)$ as the per-unit cost of X for tax purposes in the United States, $C_X(r_u, w_u)$ as the accounting cost of X in the United States, $C_I^* \equiv C_I(r_c - t_c r_c^*, w_c(1-t_c))$ as the per-unit cost of I in Canada in the presence of Canadian corporate taxes and capital cost allowances, and $C_I^{**} \equiv C_I(r_c^*, w_c)$ as the per-unit cost of I for Canadian corporate tax purposes. Invoke the Canadian customs rule that tariffs be levied on the per-unit cost of X marked up by 15 per cent, that is, tariffs per unit of $X \equiv [r_u K_u + w_u L_u] / X (1.15) \tau_{cu}^X \equiv C_c(r_u, w_u) (1.15) \tau_{cu}^X$; then $C_Q^* \equiv C_Q(C_I^{**}, g + C_X(r_u, w_u) (1.15) \tau_{cu}^X)$ is the per-unit cost of Q for tax purposes. The *Eli Lilly* rule may be stated as defining an η such that:

$$\eta / C_X(r_u^*, w_u) \geq P / C_Q(C_I^{**}, g + C_X(r_u, w_u) (1.15) \tau_{cu}^X). \quad (A.13)$$

Given that $t_c = 0.46$, while t_u varies between 0.46 and 0.51 depending on the existence of US state corporate income taxes, we know that there is an incentive for firms to set low transfer prices in this setting. Therefore, constraint (A.13) is a binding one, so that

$$\eta = PC_X(r_u^*, w_u) / C_Q(C_I^{**}, g + 1.15 C_X(r_u, w_u) \tau_{cu}^X). \quad (A.14)$$

Profits for the US sector may be written as

$$\Pi_u^X = gX - r_u K_u - w_u L_u - t_u (\eta X - r_u^* K_u - w_u L_u),$$

or, upon substitution of (A.14) and using Propositions 1 and 2,

$$\begin{aligned} \Pi_u^X = gX - t_u XP, C_X(r_u^*, w_u) / C_Q(C_I^{**}, g + 1.15 C_X(r_u, w_u) \tau_{cu}^X) \\ - C_X(r_u - t_u r_u^*, w_u(1-t_u)) X, \end{aligned} \quad (A.15)$$

where $C_X(r_u - t_u r_u^*, w_u(1-t_u))$ is the per-unit production cost of X in the presence of US corporate income taxes and capital cost allowances.

Profits for the Canadian sector may be written as

$$\begin{aligned} \Pi_u^Q = P \cdot Q - C_I \cdot I - (g + 1.15 C_X(r_u, w_u) \tau_{cu}^X) X \\ - t_c (P \cdot Q - C_I^{**} \cdot I - (g + 1.15 C_X(r_u, w_u) \tau_{cu}^X) X). \end{aligned} \quad (A.16)$$

Using Propositions 1 and 2, (A.16) becomes

$$\Pi_c^Q = P \cdot Q(1-t_c) - C_Q(C_I^*, (g + 1.15 C_X(r_u, w_u) \tau_{cu}^X) (1-t_c)) Q. \quad (\text{A.17})$$

Unlike the scenario where there is no constraint on transfer pricing, binding constraints such as (A.13) alter the per-unit cost of producing X where costs include the tax bill. Thus, for the profit functions defined in (A.15) and (A.17), the corresponding per-unit costs (prices) including tax costs are

$$g = C_X(r_u - t_u r_u^*, w_u(1-t_u)) + t_c P C_X(r_u^*, w_u) / \left[C_Q(C_I^{**}, g + 1.15 C_X(r_u, w_u) \tau_{cu}^X) \right], \quad (\text{A.18})$$

$$P = C_Q(C_I^*, g + 1.15 C_X(r_u, w_u) \tau_{cu}^X (1-t_c)) / (1-t_c). \quad (\text{A.19})$$

g is defined implicitly in equation (A.18) and depends on feedback from the price and per-unit cost for tax purposes of Q . Although we cannot solve explicitly for g , we can infer that the optimal g exceeds the marginal costs for X . In the absence of any constraint on transfer prices for tax purposes, the profit-maximizing behaviour for the firm would be to set the implicit transfer price equal to the marginal cost of X and declare revenue such that taxable profits would be zero in the United States, the high-tax region, where X is produced. Then, the left-hand side of (A.13) could be one. In the presence of a capital cost allowance for capital services in the production of Q in region c , which underestimates the economic cost of these services, the right-hand side of (A.13) would exceed one. If the US tax authorities require the firm to meet a gross margin constraint on transfer prices, the firm can increase g , increasing the costs for Q and driving down the gross margin on Q , and/or increase η , increasing the tax payments in the higher-tax region and driving up the reported gross margin on X . Clearly, the firm selects the options which meet the constraint but leave profits after taxes as high as possible. Depending on the substitutability between η and implicit transfer prices for any given profit level, we would, in general, expect η and marginal costs for X to be higher in the constrained than the unconstrained case.

Again, for the free-trade scenarios, the absence of tariffs has no qualitative effect on the economic argument, although obviously $\tau_{cu}^X = 0$ changes the magnitudes of the cost variables.

The final case of interest for the application of this gross margin rule for US income tax purposes involves the production of the semifinished good in Canada and the production of Q in the United States ($X(c)$, $Q(u)$). The *Eli Lilly* rule now involves defining η such that

$$P / \left\{ [r_u^* K_u + w_u L_u + (\eta + 1.15 C_X(r_c, w_c) \tau_{uc}^X) X] / Q \right\} \geq g / C_X(r_c^*, w_c), \quad (\text{A.20})$$

where K_u, L_u, X are used in the production of Q .

Again, if $t_u > t_c$, there is an incentive in the absence of a constraint such as (A.20) to set η such that taxable profits in the United States are zero. Therefore, we would expect (A.20) to be a binding constraint, so that

$$[r_u^* K_u + w_u L_u + (\eta + 1.15 C_X(r_c, w_c) \tau_{cu}^X) X] = PQ C_X(r_c^*, w_c) / g. \quad (\text{A.21})$$

Substituting (A.21) into the definition of sectoral profits for the firm yields

$$\Pi_c X \equiv gX(1-t_c) - C_X(r_c - t_c r_c^*, w_c(1-t_c))X, \quad (\text{A.22})$$

$$\begin{aligned} \Pi_u Q &= P \cdot Q[1-t_u(1-C_X(r_c^*, w_c)g)] \\ &\quad - C_Q(C_I, g + 1.15 C_X(r_c, w_c) \tau_{cu}^X)Q. \end{aligned} \quad (\text{A.23})$$

In this case the corresponding per-unit costs (prices) including tax and tariff costs are

$$g = \left[C_X(r_c - t_c r_c^*, w_c(1-t_c)) + 1.15 C_X(r_c, w_c) \tau_{uc}^X \right] / (1-t_c), \quad (\text{A.24})$$

$$P = [C_Q(C_I, g + 1.15 C_X(r_c, w_c) \tau_{cu}^X)] / [1-t_u(1-C_X(r_c^*, w_c)/g)](1+\tau_{cu}^Q), \quad (\text{A.25})$$

where $g \equiv C_X(r_c - t_c r_c^*, w_c(1-t_c)) / (1-t_c)$.

An argument similar to the last case reveals that we would expect P here to exceed the marginal costs of Q times one plus the tariff rate for imports of semi-finished goods into Canada. Starting from the unconstrained solution, we

would expect η to be set at its upper limit $\bar{\eta}$ such that the taxable profits in the United States would be zero when $t_u > t_c$. The imposition of the constraint means that the firm may either increase P or decrease η to meet the constraint. The firm would choose that combination which leaves profits as great as possible. Therefore, depending on the substitutability between η and P in the profit function, we would in general expect η and P to be higher in the constrained than in the unconstrained case.

Tax credit

The analysis of the gross margin constraint to this point assumes that the US tax authorities do not allow a US tax credit for taxes paid in foreign countries. Such a credit is of course available for branch plant operations directly owned by the parent company. Foreign subsidiaries are not allowed to be included in a consolidated return filed by the parent company, and credits for foreign taxes paid may only be claimed at the time profits are remitted as dividends to the US parent, and then only in proportion to the extent that profits are in fact remitted. There are further restrictions beyond these on the availability of credits. If dividends were remitted instantaneously and in full, the tax credit provisions would in effect substitute US tax laws for Canadian ones as far as the total liability on Canadian operations of US firms is concerned. Where the credit is indefinitely deferred, for instance by retaining earnings within the subsidiary, the Canadian legislation remains operative. About the only conclusion that can be drawn with respect to the tax credits available in practice is that they fall between these limits and so weaken the 'bite' of Canadian tax legislation and its decision-distorting effects.

Customs duties on cost markup

Scenarios 2b and 4d in Table A.1 consider respectively a world of no taxes and customs duties and a world of taxes and custom duties where the custom duties in the presence of non-arm's-length transactions between affiliated firms are levied on the basis of a 10 or 15 per cent markup on accounting costs. For the no-tax world, where sectors of the firm are located in different regions, the per-unit costs become

$$g = [C_X(w_u, r_u) + C_X(w_u^a, r_u^a)(1+k)\tau_{cu}^X] / (1-t_u),$$

$$P = C_Q(C_I(w_c, r_c), g) / (1-t_c),$$

for $X(u)$, $Q(c)$

and

$$g = [C_X(w_c, r_c) + C_X(w_c^a, r_c^a) (1+k) \tau_{uc}^X] / (1-t_c),$$

$$P = C_Q(C_I(w_u, r_u), g) (1 + \tau_{cu}^Q) / (1-t_c),$$

for $X(c), Q(u)$

where $(w_u^a, r_u^a, w_c^a, r_c^a)$ are the accounting costs of labour and capital, in the United States and Canada respectively, relevant to tariff valuation and $k = 0.10$ or 0.15 is the markup.

In the case of both taxes and custom duties there may be two different valuations of non-arm's-length transactions between sectors of the firm, for example, if the *Eli Lilly* rule was invoked. In this case, in Canada, apparently the custom valuation rule usually dominates (see Ward, 1975, 115-16). We shall assume domination of customs valuation in the United States as well. Then the per-unit costs for sectors of the firm in different regions become

$$g = 1 / (1-t_u) C_X(r_u^a - t_u r_u^*, w_u^a (1-t_u)) + C_X(r_X^a, w_u^a) (1+k) \tau_{cu}^X$$

$$P = 1 / (1-t_c) C_Q(C_I^*, g - t_c (1+k - \tau_{cu}^X) C_X(r_u^a, w_u^a)),$$

for $X(u), Q(c)$

and

$$g = 1 / (1-t_c) C_X(r_c^a - t_c r_c^*, w_c (1-t_c)) + C_X(r_c^a, w_c^a) \tau_{uc}^X,$$

$$P = [1 / (1-t_u) C_Q(C_I^*, g - t_u (1+k - \tau_{uc}^X) C_X(r_c^a, w_c^a))] [1 + \tau_{cu}^Q],$$

where all variables are as previously defined.

Our final scenario concerns a free-trade world where both the United States and Canada levy taxes on sectors of the firm where non-arm's-length transactions are valued at markups of 10 or 15 per cent on accounting costs.

SUMMARY COMMENT

Each of these scenarios could be conducted under the multinational form of organization of the kind considered here where fair market values may not be obvious. If the transaction were between independent firms, so that markets existed, the resort to arbitrary valuation rules would be unnecessary and market prices could be used.

Estimation of each of these scenarios for plausible parameter values and functional forms under the assumption of the multinational and independent

forms of firm organization affords a number of comparisons. First, within each scenario, organizational form, and tax/tariff setting, we can identify the least-cost solution. Second, within each organizational form we can identify the impact on the least-cost solution of imposing certain taxes and/or tariffs with their accompanying valuation rules. Finally, within each scenario we can compare the least-cost solution between multinationals and independent firms. This is the purpose of appendix B.

APPENDIX B

Some applications of the model

INTRODUCTION

Some of the scenarios on taxes and tariffs described in appendix A do not admit an analytical solution of interest. For example, in a two-region model the imposition of a constraint that gross margins in the high-tax area be at least as great as gross margins in the low-tax area for sectors of a firm in different regions with intrafirm transactions in the absence of a market-established price alters the costs of production. Whether or not the imposition of this constraint alters the selection of the least-cost combination of jurisdictions in our world of constant returns to scale in production depends on the degree of shifting in the unit-cost function due to these tax and tariff changes. In turn, this depends on the relative costs of factors of production in the two regions, the substitutability between factors in the production process, and the relative factor intensity of that process. This appendix reports the cost calculations for those scenarios of interest for specific functional forms for the production function and specific parameter values. We focus on Canada and the United States. Further, we use linear homogeneous constant elasticity of substitution (CES) production functions, continuing to assume weak separability in the final production stage.

To illustrate our method for calculating the optimal inputs into the production process and the various cost calculations dictated by tax and tariff procedures in Canada and the United States, consider the following CES production function:

$$Z = [aK^{-\rho} + (1-a)L^{-\rho}]^{-1/\rho}, \quad (\text{B.1})$$

where Z is output and K and L are two inputs purchased in competitive input

markets at per-unit prices of r and w , respectively.

Minimizing input cost for any given level of output yields

$$\frac{L}{K} = a \left(\frac{r}{w} \right)^\sigma, \quad (\text{B.2})$$

where $\sigma \equiv 1/(1 + \rho)$, the elasticity of substitution between K and L , and $a \equiv [(1 - a)/a]^\sigma$, a constant.

For any arbitrary $\hat{K}$, it is possible to define the corresponding

$$\hat{L} = a(r/w)^\sigma \hat{K} \quad (\text{B.3})$$

and

$$\hat{Z} = [a + (1 - a) ((w/(1 - a)) (a/r))^{1 - \sigma}]^{-1/\rho} \hat{K}. \quad (\text{B.4})$$

The per-unit cost of Z may be calculated as

$$[r\hat{K} + w\hat{L}]/\hat{Z}, \quad (\text{B.5})$$

which we may denote as $C(r, w)$. Furthermore, by substituting (B.3) into (B.4) and both successively into (B.5) it is possible to write

$$C(r, w) = [a(r/a)^{1 - \sigma} + (1 - a) (w/(1 - a))^{1 - \sigma}]^{1/(1 - \sigma)}. \quad (\text{B.6})$$

There is computational convenience to this procedure. The scenarios described in Table A.1 dictate changes in the relative factor prices. Varying factor prices require variation in the ratio of optimal inputs. Therefore it is possible to calculate readily the optimal input ratio and per-unit output cost using this procedure. For the six parameters involved in our cost calculations, we have chosen the following values:

$$a_X, a_I, a_Q = 0.5, 0.75,$$

$$\sigma_X, \sigma_I, \sigma_Q = 0.01, 0.5, 0.99, 1.50, 2.50.$$

It is important to note that factor shares vary with a but are not necessarily equal to a . It is well known and straightforward to show that

$$\frac{K}{Z} \frac{\partial Z}{\partial K} = a \left(\frac{Z}{K} \right)^\rho, \quad \frac{L}{Z} \frac{\partial Z}{\partial L} = (1 - a) \left(\frac{Z}{L} \right)^\rho.$$

Therefore, α measures the respective factor share if and only if $\rho = 0$, i.e. $\sigma = 1$, or if the CES production function is Cobb-Douglas. However, for given average products and elasticities of substitution, K 's (L 's) factor share does vary directly (inversely) with α .

For the basic no-tax, free-trade scenario, these values yield 1,000 cost calculations. As we move across varying tax and tariff conditions with more than one tax or tariff valuation, the number of calculations increases proportionately. It is not possible to report all of these. We restrict our attention to those parameter values justified by other empirical studies and those that exhibit sensitivity to change across the various scenarios.

DISCUSSION OF PSEUDO-EMPIRICS

Tables B.1 to B.4 report the least-cost jurisdictions of production for firms organized either independently or multinationally. Where firms are organized independently, tariffs are levied on competitive market prices, that is, firms deal at arm's length with each other at market prices equal to marginal costs. Arbitrary valuations enter only when the least-cost solution for the supply of the commodity to the Canadian market involves a border between the sectors of the firm, that is, firms do not deal at arm's length across a border. We abstract from administrative and organizational costs, which may alter the choice of the efficient form of the organization. Rather, our focus is on the impact of these arbitrary valuation rules, when they apply, on both the least-cost jurisdictional arrangements for production and the value added by capital and labour and on the magnitude of the transfers to governments, either through tariff payments or tax payments or both.

The tables, organized so that comparisons are possible between settings where firms are organized either independently or multinationally, facilitate an analysis of the impact on the employment of labour and capital of the multinational as against the independent form of organization. Of course where international organization is desirable the cheaper form of organization will be chosen. We would expect that in each such case, ignoring administrative costs, the multinational form should be cheaper because it allows the possibility of manipulation of the transfer prices. For example, inspection of Tables B.1 and B.3 reveals that for $\alpha_X = \alpha_I = \alpha_Q = 0.5$, $\tau_{ij}^X = 0.10$, $\tau_{ij}^Q = 0.15$, $t_c = 0.46$, $t_u = 0.51$, $\sigma_X = 0.99$, $\sigma_I = 0.10$, and $\sigma_Q = 0.01$ in Scenario 4c (*Eli Lilly* rule), international organization is desirable. The per-unit cost of the commodity in Canada for independent firm organization is \$13.74, while the per-unit cost from multinational organizations is \$13.24. For $\alpha_X, \alpha_I, \alpha_Q = 0.75$, $\sigma_X = 0.99$, $\sigma_I = 0.01$, $\sigma_Q = 2.5$, with

TABLE B.1

Least-cost jurisdictions for Canada–United States independent firm production model using CES production functions

			Scenario		
σ_X	For σ_I	σ_Q	2	3	4
0.01	0.01	0.01	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
		0.99	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
		2.5	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
	0.99	0.01	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
		0.99	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
		2.5	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
	2.5	0.01	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
		0.99	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
		2.5	$X(u) \ Q(u)$	$X(u) \ Q(u)$	$X(c) \ Q(c)$
0.99	0.01	0.01	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
		0.99	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
		2.5	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
	0.99	0.01	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
		0.99	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
		2.5	$X(c) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(u)$
	2.5	0.01	$X(u) \ Q(u)$	$X(u) \ Q(u)$	$X(u) \ Q(u)$
		0.99	$X(u) \ Q(u)$	$X(u) \ Q(u)$	$X(u) \ Q(u)$
		2.5	$X(u) \ Q(u)$	$X(u) \ Q(u)$	$X(u) \ Q(u)$
0.25	0.01	0.01	$X(u) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
		0.99	$X(u) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
		2.5	$X(u) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
	0.99	0.01	$X(u) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
		0.99	$X(u) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
		2.5	$X(u) \ Q(c)$	$X(u) \ Q(u)$	$X(u) \ Q(c)$
	2.5	0.01	$X(u) \ Q(u)$	$X(u) \ Q(u)$	$X(u) \ Q(u)$
		0.99	$X(u) \ Q(u)$	$X(u) \ Q(u)$	$X(u) \ Q(u)$
		2.5	$X(u) \ Q(u)$	$X(u) \ Q(u)$	$X(u) \ Q(u)$

NOTE: Values for the per-unit cost of labour and capital for each scenario are discussed and reported in chapter 4; a_X, a_I, a_Q , the distribution parameters for labour, are set equal to 0.50 in the table; τ_{ij}^X , the tariff rate on semifinished goods, is set equal to 0.10; τ_{ij}^Q , the tariff rate on finished goods, is set equal too .15; t_c and t_u , the tax rates on corporate profit, are set equal to 0.46 and 0.51 respectively. $X(i) \ Q(j)$ represents least-cost jurisdictions for production where $i, j, = c$ (Canada), u (United States).

TABLE B.2
Least-cost jurisdictions for Canada–United States independent firm model using CES
production functions

For σ_X σ_I σ_Q			Scenario		
			2	3	4
0.01	0.01	0.01	$X(c)$ $Q(c)$	$X(u)$ $Q(u)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(u)$ $Q(u)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(u)$ $Q(u)$	$X(c)$ $Q(c)$
	0.99	0.01	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
	2.5	0.01	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
0.99	0.01	0.01	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
	0.99	0.01	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
	2.5	0.01	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
2.5	0.01	0.01	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
	0.99	0.01	$X(c)$ $Q(c)$	$X(c)$ $Q(u)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
	2.5	0.01	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
		0.99	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$
		2.5	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$	$X(c)$ $Q(c)$

NOTE: Values for the per-unit cost of labour and capital for each scenario are reported in chapter 4; a_X , a_I , a_Q , the distribution parameters for labour, are set equal to 0.75 in this table; τ_{ij}^X , the tariff rate on semifinished goods, is set equal to 0.10; τ_{ij}^Q , the tariff rate on finished goods, is set equal to 0.15; t_c and t_u , the tax rates on corporate profits, are set equal to 0.46 and 0.51 respectively. $X(i)$ $Q(j)$ represents least-cost jurisdiction for production where $i, j, = c(\text{Canada}), u(\text{United States})$.

TABLE B.3

Least-cost jurisdictions for Canada–United States multinational firm production model using CES production functions

For σ_X σ_I σ_Q			Scenario					
			1	2b	3c	3d	4c	4d
0.01	0.01	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
	0.99	0.01	$X(c) Q(u)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(u)$	$X(v) Q(v)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(u)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
	2.5	0.01	$X(c) Q(u)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(u)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(u)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
0.99	0.01	0.01	$X(u) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		0.99	$X(u) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		2.5	$X(u) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
	0.99	0.01	$X(u) Q(u)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		0.99	$X(u) Q(u)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		2.5	$X(u) Q(u)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
	2.5	0.01	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$
		0.99	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$
		2.5	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$
2.5	0.01	0.01	$X(c) Q(u)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(u)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(u)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
	0.99	0.01	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$
		0.99	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$
		2.5	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$
	2.5	0.01	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(u)$
		0.99	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$
		2.5	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(u) Q(u)$

NOTE: See note to Table B.1.

TABLE B.4

Least Cost Solution for Canada–United States multinational firm production model using CES production functions

For			Scenario					
σ_X	σ_I	σ_Q	1	2b	3c	3d	4c	4d
0.01	0.01	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
	0.99	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$
	2.5	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$
0.99	0.01	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(u) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(u)$	$X(c) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(u)$	$X(u) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
	0.99	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
	2.5	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(u) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
2.5	0.01	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(u)$	$X(c) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(u)$	$X(c) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(u)$	$X(c) Q(u)$	$X(c) Q(u)$	$X(c) Q(c)$
	0.99	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(u)$	$X(c) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(u)$	$X(c) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(u)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
	2.5	0.01	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
		0.99	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$
		2.5	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$	$X(c) Q(c)$

NOTE: See note to Table B.2.

TABLE B.5
Summary statistics on least-cost jurisdictions for Canada–United States independent firm production models using CES production functions (percentage of least-cost solutions in each jurisdiction)

Scenario	Case	$X(u)$	$Q(u)$	$X(u)$	$Q(c)$	$X(c)$	$Q(u)$	$X(c)$	$Q(c)$
2									
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.15$	8.8		17.2		0		74.0	
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.20$	4.8		18.0		0		77.2	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.15$	10.1		7.9		0		82.0	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.20$	4.8		9.0		0		86.2	
3									
	$t_u = 0.46, t_u = 0.46$	49.0		21.0		21.0		9.0	
	$t_u = 0.51, t_u = 0.46$	49.0		21.0		21.0		9.0	
4									
	$t_u = 0.46, t_c = 0.46$								
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.15$	13.9		31.5		0.4		34.2	
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.20$	3.1		38.4		0.2		58.3	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.15$	18.6		12.6		0		68.8	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.20$	7.6		16.0		0		76.4	
4									
	$t_u = 0.51, t_c = 0.46$								
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.15$	5.0		27.0		0.2		67.8	
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.20$	0.6		29.7		0		69.7	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.15$	7.7		7.4		0		84.9	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.20$	1.5		9.0		0		89.5	

NOTE: Each row represents 1000 calculations based on the following values:
 $a_X, a_I, a_Q = 0.50, 0.75; \sigma_X, \sigma_I, \sigma_Q = 0.01, 0.5, 0.99, 1.5, 2.5$.

TABLE B.6

Summary statistics on least-cost jurisdictions for Canada–United States multinational firm production models using CES production functions (percentage of least-cost solutions in each jurisdiction)

Scenario	Case	$X(u) \quad Q(u)$		$X(u) \quad Q(c)$		$X(c) \quad Q(u)$		$X(c) \quad Q(c)$	
1		16.0		24.0		24.0		36.0	
2b									
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.15$	9.1		16.9		0		74.0	
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.20$	4.8		18.0		0		77.2	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.15$	10.4		7.6		0		82.0	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.20$	5.4		8.4		0		86.2	
3c									
	$t_u = 0.46, t_c = 0.46$	38.4		34.8		23.2		3.6	
	$t_u = 0.51, t_c = 0.46$	30.8		39.8		23.8		5.6	
3d									
	$t_u = 0.46, t_c = 0.46$	54.0		19.0		24.1		2.9	
	$t_u = 0.51, t_c = 0.46$	53.8		16.2		23.8		6.2	
4c									
	$t_u = 0.46, t_c = 0.46$								
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.15$	5.2		47.4		9.2		38.2	
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.20$	0.6		49.9		6.8		42.7	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.15$	8.5		28.8		7.3		55.4	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.20$	1.6		31.3		6.0		61.1	
4c									
	$t_u = 0.51, t_c = 0.46$								
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.15$	0.4		47.0		9.1		43.5	
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.20$	0		47.5		6.4		46.1	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.15$	1.1		30.3		7.1		61.5	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.20$	0		31.0		5.2		63.8	
4d									
	$t_u = 0.46, t_c = 0.46$								
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.15$	17.0		43.3		2.7		37.0	
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.20$	4.8		54.3		2.2		38.7	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.15$	18.8		0		1.6		79.6	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.20$	7.5		0		1.5		91.0	
4d									
	$t_u = 0.51, t_c = 0.46$								
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.15$	6.5		0		2.5		91.0	
	$\tau_{ij}^X = 0.10, \tau_{ij}^Q = 0.20$	.9		0		1.0		98.1	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.15$	6.8		0		1.2		92.0	
	$\tau_{ij}^X = 0.20, \tau_{ij}^Q = 0.20$	.9		0		1.0		98.1	

NOTE: See note to Table B.5

TABLE B.7

Value-added as a percentage of final minimum unit cost for the least-cost jurisdiction for Canada–United States independent firm model using CES production functions

For		Scenario 2					Scenario 3					Scenario 4							
		σ_X	σ_I	σ_Q	$v_L(c)$	$v_K(c)$	$\tau(c)$	$v_L(u)$	$v_K(u)$	$\tau(u)$	$v_L(c)$	$v_K(c)$	$\tau(c)$	$t(c)$	$v_L(u)$	$v_K(u)$	$\tau(u)$	$t(u)$	
0.01	0.01		0.01	71.4	28.6		65.5	15.1	19.3	51.2	20.4		28.4						
			0.99	71.4	28.6		65.5	15.1	19.3	51.2	20.4		28.4						
			2.5	71.4	28.6		65.5	15.1	19.3	51.2	20.4		28.4						
			0.99	61.3	38.7		58.0	18.4	23.5	50.6	20.6		28.7						
2.5	0.99		0.99	60.8	39.2		57.9	18.5	23.6	50.6	20.6		28.7						
			2.5	60.0	40.0		57.6	18.6	23.8	50.6	20.6		28.7						
			0.01	48.9	51.1		47.7	23.0	29.3	49.7	21.0		29.3						
			0.99	45.7	54.3		46.5	23.5	30.0	49.7	21.0		29.3						
0.99	0.01		2.5			13.0	26.7	60.3		44.7	24.3	31.0	21.0						
			0.01	61.3	38.7		58.0	18.4	23.5	25.8	10.3	4.5	14.3	22.6	9.9		12.6		
			0.99	60.8	39.2		57.9	18.5	23.6	25.6	10.2	4.5	14.2	22.8	9.9		12.7		
			2.5	60.0	40.0		57.6	18.6	23.8	25.3	10.1	4.6	14.0	23.1	10.1		12.9		
2.5	0.99		0.01	50.2	49.8		50.2	21.9	27.9	25.2	10.5	4.5	14.7	22.6	9.9		12.6		
			0.99	50.2	49.8		50.2	21.9	27.9	25.0	10.5	4.5	14.5	22.8	9.9		12.7		
			2.5	50.2	49.8		50.2	21.9	27.9	24.7	10.3	4.6	14.6	23.1	10.1		12.9		
			0.01			13.0	29.2	57.8		39.2	26.7	34.1	13.0		34.1	23.2		29.6	
0.99	0.99		0.99			13.0	26.2	60.7		38.8	26.9	34.3	13.0		33.7	23.4		29.9	
			2.5			13.0	21.7	65.2		38.1	27.2	34.7	13.0		33.2	23.6		30.2	
			0.01	43.3	17.4	3.6	3.5	32.2		47.7	23.0	29.3	26.8	10.7	4.3	14.9	11.9	13.8	17.6
			0.99	35.8	14.4	4.5	4.5	40.9		46.5	23.5	30.0	25.6	10.2	4.5	14.2	12.4	14.5	18.5
2.5	0.99		2.5	24.3	9.8	6.0	5.9	54.0		44.7	24.3	31.0	23.8	9.5	4.9	13.2	13.3	15.5	19.8
			0.01	29.3	29.0	3.8	3.8	34.2		39.2	26.7	34.1	26.2	10.9	4.3	15.2	11.9	13.8	17.6
			0.99	25.2	24.9	4.5	4.5	40.9		38.8	26.9	34.3	25.0	10.5	4.5	14.6	12.4	14.5	18.5
			2.5	18.9	18.7	5.7	5.6	51.1		38.1	27.2	34.7	23.2	9.7	4.9	13.5	13.3	15.5	19.8
0.99	2.5		0.01			13.0	8.6	78.4		27.4	31.9	40.7	13.0		23.8	27.7		35.4	
			0.99			13.0	8.6	78.4		27.4	31.9	40.7	13.0		23.8	27.7		35.4	
			2.5			13.0	8.6	78.4		27.4	31.9	40.7	13.0		23.8	27.7		35.4	
			0.01			13.0	8.6	78.4		27.4	31.9	40.7	13.0		23.8	27.7		35.4	

NOTE: $v_L(i)$, $v_K(i)$ denote percentage value-added by labour and capital respectively in $i = c$ (Canada), u (United States); $\tau(i)$ denotes percentage tariff payments in $i = c$, u ; $t(i)$ denotes percentage corporate profits tax payments in $i = c$, u ; values for the per-unit cost of labour and capital are discussed and reported in chapter 4; a_X , a_I , a_Q , the distribution parameters for labour, are set equal to 0.50; τ_{ij}^X , the tariff rate in semifinished goods, is set equal to 0.10; τ_{ij}^Q , the tariff rate unfinished goods, is set equal to 0.15; t_c , t_u , the tax rates on corporate profits, are set equal to 0.46 and 0.51 respectively.

TABLE B.8

Value-added as a percentage of final minimum unit cost for the least-cost jurisdiction for Canada–United States independent firm model using CES production functions

For		Scenario 2				Scenario 3				Scenario 4				
		σ_Q	$v_L(c)$	$v_K(c)$	$\tau(c)$	$v_L(u)$	$v_K(u)$	$\tau(u)$	$v_L(c)$	$v_K(c)$	$\tau(c)$	$v_L(u)$	$v_K(u)$	$\tau(u)$
σ_X	σ_I													
0.01	0.01	0.01	76.6	28.4		65.8	15.0	19.2	51.5	20.3		28.2		
		0.99	71.6	28.4		65.8	15.0	19.2	51.5	20.3		28.2		
		2.5	71.6	28.4		65.8	15.0	19.2	51.5	20.3		28.2		
	0.99	0.01	73.3	26.7		36.6	5.2	7.2	62.5	15.7		21.8		
2.5		0.99	74.1	25.9		55.9	7.9	11.0	68.9	13.0		18.1		
		2.5	74.8	25.2		70.6	9.9	13.8	73.6	11.0		15.4		
	2.5	0.01	75.6	24.4		43.2	1.2	1.7	70.2	12.4		17.3		
		0.99	77.6	22.4		69.9	2.0	2.8	82.9	7.1		9.9		
0.99		2.5	79.2	20.8		89.1	2.6	3.6	91.7	3.5		4.8		
	0.01	0.01	73.3	26.7		36.2	5.1	7.1	62.4	15.7		21.9		
		0.99	72.4	27.6		18.8	2.7	3.7	57.4	17.8		24.8		
		2.5	71.8	28.2		4.9	0.7	1.0	53.2	19.6		27.3		
2.5	0.99	0.01	75.0	25.0		74.8	10.5	14.7	74.8	10.5		14.7		
		0.99	75.0	25.0		74.8	10.5	14.7	74.8	10.5		14.7		
		2.5	75.0	25.0		74.8	10.5	14.7	74.8	10.5		14.7		
	2.5	0.01	77.3	22.7		83.7	6.8	9.5	83.7	6.8		9.5		
2.5		0.99	78.5	21.5		88.8	4.7	6.5	88.8	4.7		6.5		
		2.5	79.4	20.6		92.6	3.1	4.3	92.6	3.1		4.3		
	0.01	0.01	75.6	24.4		42.6	1.2	1.7	70.0	12.5		17.5		
		0.99	73.6	26.4		23.5	0.7	0.9	62.1	15.9		22.1		
0.99		2.5	72.1	27.9		7.2	0.2	0.3	55.0	18.8		26.2		
		0.01	77.3	22.7		83.6	6.9	9.6	83.6	6.9	9.6	9.6		
		0.99	76.1	23.9		79.5	8.6	11.9	79.5	8.6	11.9	11.9		
		2.5	75.3	24.7		76.1	10.0	13.9	76.1	10.0	13.9	13.9		
2.5	2.5	0.01	79.6	20.4		93.5	2.7	3.8	93.5	2.7		3.8		
		0.99	79.6	20.4		93.5	2.7	3.8	93.5	2.7		3.8		
		2.5	79.6	20.4		93.5	2.7	3.8	93.5	2.7		3.8		
		2.5	79.6	20.4		93.5	2.7	3.8	93.5	2.7		3.8		

NOTE: See note to Table B.7, except that $\alpha_X, \alpha_I, \alpha_Q$, the distribution parameters for labour, are set equal to 0.75.

TABLE B.9

Value-added as a percentage of final minimum unit cost for the least-cost jurisdiction for Canada–United States multinational firm model using CES production functions (Scenarios 1, 2b, 3c)

For		Scenario 1				Scenario 2b				Scenario 3c			
		σ_X	σ_I	σ_Q	$v_L(c)$	$v_K(c)$	$v_L(u)$	$v_K(u)$	$v_L(c)$	$v_K(c)$	$\tau(u)$	$v_L(c)$	$v_K(u)$
0.01	0.01	0.01		0.01	71.4	28.6			71.4	28.6			
		0.99		0.99	71.4	28.6			71.4	28.6			
		2.5		2.5	71.4	28.6			71.4	28.6			
	0.99	0.01		0.01	39.0	15.7	22.8	22.5	61.3	38.7			
		0.99		0.99	35.7	14.3	25.2	24.8	60.8	39.0			
		2.5		2.5	30.7	12.3	28.7	28.3	60.0	40.0			
	2.5	0.01		0.01	44.9	18.0	3.7	33.4	48.9	51.1			
		0.99		0.99	35.8	14.4	4.9	44.9	45.7	54.3			
		2.5		2.5	22.1	8.9	6.8	62.2			13.0	26.7	60.3
0.99	0.01	0.01		0.01	39.0	15.7	22.8	22.5	61.3	38.7			
		0.99		0.99	35.7	14.3	25.2	24.8	60.8	39.2			
		2.5		2.5	30.7	12.3	28.7	28.3	60.0	40.0			
	0.99	0.01		0.01			50.4	49.6	50.2	49.8			
		0.99		0.99			50.4	39.4	50.2	39.4			
		2.5		2.5			50.4	49.6	50.2	49.8			
	2.5	0.01		0.01			33.6	66.4					
		0.99		0.99			30.2	69.8					
		2.5		2.5			25.0	75.0					
2.5	0.01	0.01		0.01	44.9	18.0	3.7	33.4	43.1	17.3			
		0.99		0.99	35.8	14.4	4.9	44.9	35.8	14.4			
		2.5		2.5	22.1	8.9	6.8	62.2	24.7	9.9			
	0.99	0.01		0.01			33.6	66.4	29.1	28.9			
		0.99		0.99			30.2	69.8	25.2	24.9			
		2.5		2.5			25.0	75.0	19.1	18.9			
	2.5	0.01		0.01			9.9	90.1					
		0.99		0.99			9.9	90.1					
		2.5		2.5			9.9	90.1					

NOTE: See note to Table B.7.

TABLE B.10

Value-added as a percentage of final minimum unit cost for the least-cost jurisdiction for Canada–United States multinational firm model using CES production functions (Scenarios 3d, 4c, 4d)

For		Scenario 3d										Scenario 4c										Scenario 4d									
		σ_X	σ_I	σ_Q	$v_L(c)$	$v_K(c)$	$t(c)$	$v_L(u)$	$v_K(u)$	$t(u)$	$v_L(c)$	$v_K(c)$	$\tau(c)$	$t(c)$	$v_L(u)$	$v_K(u)$	$\tau(u)$	$t(u)$	$v_L(c)$	$v_K(c)$	$\tau(c)$	$t(c)$	$v_L(u)$	$v_K(u)$	$\tau(u)$	$t(u)$					
0.01	0.01	0.01	0.01	0.01	65.5	15.1	19.3	25.7	10.2	4.6	14.2	30.8	7.1	7.3	51.2	20.4		28.4													
		0.99			65.5	15.1	19.3	51.2	20.4		28.4				51.2	20.4		28.4													
		2.5			65.5	15.1	19.3	51.2	20.4		28.4				51.2	20.4		28.4													
		0.99	0.01		58.0	18.4	23.5	25.0	10.5	4.6	14.6	30.8	7.1	7.4	50.6	20.6		28.7													
		0.99			57.9	18.5	23.6	50.6	20.6		28.7				50.6	20.6		28.7													
	2.5	2.5			57.6	18.6	23.8	50.6	20.6		28.7				50.6	20.6		28.7													
		0.01			47.7	23.0	29.3	49.7	21.0		29.3				49.7	21.0		29.3													
		0.99			46.5	23.5	30.0	49.7	21.0		29.3				49.7	21.0		29.3													
		2.5			44.7	24.3	31.0	49.7	21.0		29.3				49.7	21.0		29.3													
0.99	0.01	0.01	0.01	0.01	58.0	18.4	13.5	27.3	10.9	4.4	15.1	23.9	10.4	8.9	50.6	20.6		28.7													
		0.99			57.9	18.5	23.6	25.6	10.2	4.6	14.2	25.4	11.1	8.9	50.6	20.6		28.7													
		2.5			57.6	18.6	23.8	23.5	9.3	4.9	13.0	27.1	11.8	10.3	50.6	20.6		28.7													
		0.01			50.2	21.9	27.9	26.6	11.1	4.4	15.0	23.9	10.4	8.1	50.0	20.9		29.1													
		0.99			50.2	21.9	27.9	25.0	10.5	4.6	14.6	25.3	11.0	9.0	50.0	20.9		29.1													
	2.5	2.5			50.2	21.9	27.9	23.0	9.6	4.9	13.4	26.8	11.7	10.5	50.0	20.9		29.1													
		0.01			39.2	26.7	34.1	25.6	11.5	4.3	16.0	23.8	10.4	8.3				29.1													
		0.99			38.8	26.9	34.3	24.1	10.8	4.6	15.1	25.1	11.0	9.3				29.1													
		2.5			38.1	27.2	34.7	22.4	10.1	4.8	14.0	26.4	11.5	10.9				29.1													
2.5	0.01	0.01	0.01	0.01	47.7	23.0	29.3	30.0	11.9	3.9	16.6	13.3	15.5	8.8	49.7	21.0		29.3													
		0.99			46.5	23.5	30.0	25.7	10.0	4.7	14.2	16.0	18.7	10.4	49.7	21.0		29.3													
		2.5			44.7	24.3	31.0	18.9	7.5	6.0	10.5	20.4	23.7	13.0	49.7	21.0		29.3													
		0.01			39.2	26.7	34.1	29.2	12.2	3.9	17.0	13.3	15.5	8.9				29.3													
		0.99			38.8	26.9	34.3	25.0	10.5	4.7	14.6	16.0	18.6	10.6				29.3													
	2.5	2.5			38.1	27.2	34.7	18.6	7.8	6.0	10.8	20.2	23.6	13.1				29.3													
		0.01			27.4	31.9	40.7	28.1	12.7	3.9	17.6	13.3	15.4	9.0				29.3													
		0.99			27.4	31.9	40.7	24.1	10.9	4.7	15.1	15.9	18.5	10.8				29.3													
		2.5			27.4	31.9	40.7	18.0	8.1	5.9	11.3	20.0	23.3	13.4				29.3													

NOTE: See note to Table B.7.

TABLE B.11

Value-added as a percentage of final minimum unit cost for the least-cost jurisdiction for Canada–United States multinational firm model using CES production functions (Scenarios 1, 2b, 3c)

For			Scenario 1				Scenario 2b				Scenario 3c				
			σ_I	σ_Q	$\nu_L(c)$	$\nu_K(c)$	$\nu_L(u)$	$\nu_K(u)$	$\tau(c)$	$\nu_L(c)$	$\nu_K(c)$	$t(c)$	$\nu_L(u)$	$\nu_K(u)$	$t(u)$
0.01	0.01	0.01	0.01	71.6	28.4				71.6	28.4			65.8	15.0	19.2
		0.99	0.99	71.6	28.4				71.6	28.4			65.8	15.0	19.2
			2.5	71.6	28.4				71.6	28.4			65.8	15.0	19.2
			0.01	73.3	26.7				73.3	26.7	5.4	7.5	35.3	8.1	5.3
			0.99	74.1	25.9				74.1	25.9	7.9	11.0	17.7	4.0	3.5
	2.5		2.5	74.8	25.2				74.8	25.2	9.9	13.8	4.0	0.9	0.9
			0.01	75.6	24.4				75.6	24.4	1.3	1.9	38.2	8.7	3.6
			0.99	77.6	22.4				77.6	22.4	2.0	2.8	18.9	4.3	2.0
			2.5	79.2	20.8				79.2	20.8	2.6	3.5	4.2	1.0	0.5
0.99	0.01	0.01	0.01	73.3	26.7				73.3	26.7			70.3	13.1	16.7
		0.99	0.99	72.4	27.6				72.4	27.6	2.5	3.5	50.6	11.6	14.2
			2.5	71.8	28.2				71.8	28.2	0.5	0.7	64.1	14.7	16.5
			0.01	75.0	25.0				75.0	25.0	5.3	7.4	38.9	5.7	4.7
			0.99	75.0	25.0				75.0	25.0	10.5	14.7			
	2.5		2.5	75.0	25.0				75.0	25.0	10.5	14.7			
			0.01	77.3	22.7				77.3	22.7	1.3	1.8	42.1	6.2	2.8
			0.99	78.5	21.5				78.5	21.5	2.0	2.8	20.6	3.0	1.5
			2.5	79.4	20.6				79.4	20.6	2.6	3.6	4.5	0.7	0.4
2.5	0.01	0.01	0.01	75.6	24.4				75.6	24.4	1.3	1.8	37.7	8.6	5.9
		0.99	0.99	73.6	26.4				73.6	26.4	0.6	0.9	55.5	12.7	8.6
			2.5	72.1	27.9				72.1	27.9	0.1	0.2	69.6	16.0	10.2
			0.01	77.3	22.7				77.3	22.7	1.3	1.8	36.9	9.2	6.1
			0.99	76.1	23.9				76.1	23.9	0.6	0.9	54.5	13.5	8.6
	2.5		2.5	75.3	24.7				75.3	24.7	0.1	0.2	68.3	17.0	9.9
			0.01	79.6	20.4				79.6	20.4	2.7	3.8			
			0.99	79.6	20.4				79.6	20.4	2.7	3.8			
			2.5	79.6	20.4				79.6	20.4	2.7	3.8			

NOTE: See note to Table B.8.

TABLE B.12

Value-added as a percentage of final minimum unit cost for the least-cost jurisdiction for Canada–United States multinational firm model using CES production functions (Scenarios 3d, 4c, 4d)

For			Scenario 3d						Scenario 4c						Scenario 4d												
			σ_X	σ_I	σ_Q	$v_L(c)$	$v_K(c)$	$t(c)$	$v_L(u)$	$v_K(u)$	$t(u)$	$v_L(c)$	$v_K(c)$	$\tau(c)$	$t(c)$	$v_L(u)$	$v_K(u)$	$\tau(u)$	$t(u)$	$v_L(c)$	$v_K(c)$	$\tau(c)$	$t(c)$	$v_L(u)$	$v_K(u)$	$\tau(u)$	$t(u)$
0.01	0.01	0.01	0.01				65.8	15.0	19.2	25.9	10.2	4.6	14.2	30.8	7.0		7.2	51.5	20.3		28.2						
		0.99			65.8	15.0	19.2	51.5	20.3		28.2							51.5	20.3		28.2						
		2.5			65.8	15.0	19.2	51.5	20.3		28.2							51.5	20.3		28.2						
		0.01	36.4	5.1	7.6	33.4	7.6	9.7	36.5	5.1	5.0	7.1	33.6	7.7		4.9	62.5	15.7		21.8							
		0.99	55.9	7.9	11.2	16.4	3.8	4.8	55.9	7.9	2.4	11.0	16.0	3.7		3.1	68.9	13.0		18.1							
		2.5	70.7	10.0	13.9	3.6	0.8	1.0	71.0	10.0	0.5	13.9	3.2	0.7		0.7	73.6	11.0		15.4							
		0.01	42.8	1.2	2.3	35.3	8.1	10.3	43.8	1.3	5.4	1.8	36.1	8.2		3.4	70.2	12.4		17.3							
		0.99	69.9	2.0	3.1	16.4	3.8	4.8	69.9	2.0	2.6	2.8	17.0	3.9		1.8	82.9	7.1		9.9							
		2.5	89.2	2.6	3.6	3.0	0.7	0.9	89.0	2.6	0.5	3.6	3.3	0.7		0.4	91.7	3.5		4.8							
0.99	0.01	0.01	36.8	5.2	7.2	34.5	7.9	8.5	62.4	15.7		21.9						62.4	15.7		21.9						
		0.99	19.5	2.7	3.8	49.2	11.2	13.5	57.4	17.8		24.8						57.4	17.8		24.8						
		2.5	5.3	0.7	1.0	61.3	14.0	17.6	53.2	19.6		27.3						53.2	19.6		27.3						
		0.01	74.8	10.5	14.7				74.8	10.5	14.7							74.8	10.5		14.7						
		0.99	74.8	10.5	14.7				74.8	10.5		14.7						74.8	10.5		14.7						
		2.5	74.8	10.5	14.7				74.8	10.5		14.7						74.8	10.5		14.7						
		0.01	83.7	6.8	9.5				83.7	6.8		9.5						83.7	6.8		9.5						
		0.99	88.8	4.7	6.5				88.8	4.7		6.5						88.8	4.7		6.5						
		2.5	92.6	3.1	4.3				92.6	3.1		4.3						92.6	3.1		4.3						
2.5	0.01	0.01	45.1	1.3	1.8	38.0	8.7	5.1	70.0	12.5		17.5						70.0	12.5		17.5						
		0.99	26.9	0.8	1.1	49.2	11.2	10.8	62.1	15.9		22.1						22.1	15.9		22.1						
		2.5	9.8	0.3	0.4	59.8	13.6	16.1	2.8	0.1	13.0	0.1	61.1	14.0	0.3	8.5	55.0	18.8		26.2							
		0.01	45.7	1.3	1.8	42.9	6.3	2.0	83.6	6.9		6.9						83.6	6.9		9.6						
		0.99	26.9	0.8	1.1	56.1	8.2	7.0	79.5	8.6		11.9						79.5	8.6		11.9						
		2.5	76.1	10.0	13.9				76.1	10.0		13.9						76.1	10.0		13.9						
		0.01	93.5	2.7	3.8				93.5	2.7		3.8						93.5	2.7		3.8						
		0.99	93.5	2.7	3.8				93.5	2.7		3.8						93.5	2.7		3.8						
		2.5	93.5	2.7	3.8				93.5	2.7		3.8						93.5	2.7		3.8						

NOTE: See note to Table B.8.

TABLE B.13

Capital's share in three-digit manufacturing industries of Canada: summary

Size of capital's share	Number of 3-digit industries		Percentage of total gross value added	
	1970	1974	1970	1974
0 – 0.200	1	0	1.5	0
0.201 – 0.300	4	0	2.6	0
0.301 – 0.350	9	3	6.4	1.9
0.351 – 0.400	21	13	21.4	7.8
0.401 – 0.450	23	17	18.3	8.9
0.451 – 0.500	19	26	22.8	27.8
0.501 – 0.550	14	16	9.1	13.7
0.551 – 0.600	8	14	5.9	8.9
0.601 – 0.650	7	9	5.4	12.4
0.651 – 0.775	6	14	6.6	18.6
Total	112	112	100	100

NOTE: Capital's share is calculated as (Gross value added – Total employees' salaries)/ (Gross value added).

SOURCE: Statistics Canada, *Manufacturing Industries of Canada, Type of Organization and Size of Establishments, 1970, 1974*

TABLE B.14

Capital's share in three-digit manufacturing industries of Canada

Industry size group		Capital's share		Percentage of total gross value added	
Code	Name	1970	1974	1970	1974
101	Slaughtering & meat processors	0.397	0.481	2.0	2.1
	Poultry processors				
102	Fish products industry	0.464	0.491	0.7	0.7
103	Fruit & vegetable canners & preserves	0.553	0.606	1.1	1.0
	frozen fruit & vegetable processors				
104	Dairy products industry	0.494	0.530	1.8	1.5
105	Flour & breakfast cereal products	0.581	0.633	0.4	0.4
	industry				
106	Feed industry	0.604	0.649	0.7	0.6
107	Biscuit manufacturing	0.407	0.458	1.6	1.4
	Bakeries				
108	Confectionery manufacturers	0.638	0.653	2.7	2.3
	Cane & beet sugar processors				
	Vegetable oil mills				
	Miscellaneous food processors, NES				
109	Soft drink manufacturers	0.693	0.669	3.5	2.9
	Distilleries				
	Breweries				
	Wineries				
151	Leaf tobacco processors	0.527	0.679	0.1	0.0
153	Tobacco products manufacturers	0.654	0.693	0.9	0.8
162	Rubber products industries	0.506	0.501	1.7	1.4
165	Plastics fabricating industry, NES	0.512	0.560	1.1	1.3
172	Leather tanneries	0.379	0.416	0.1	0.1
174	Shoe factories	0.338	0.364	0.6	0.4
175	Leather glove factories	0.357	0.424	0.1	0.1
179	Boot & shoe findings manufacturers	0.379	0.436	0.2	0.2
	Miscellaneous leather products				
	manufacturers				
181	Cotton yarn & cloth mills	0.363	0.506	0.5	0.4
182	Wool yarn & cloth mills	0.402	0.461	0.3	0.2
183	Fibre & filament yarn manufacturers	0.455	0.477	1.1	.9
	Throwsters, spun yarn & cloth mills				
184	Cordage & twine industry	0.358	0.601	0.0	.0
185	Fibre processing mills	0.453	0.497	0.1	.1
	Pressed & punched felt mills				
186	Carpet, mat & rug industry	0.539	0.576	0.3	.4
187	Cotton & jute bags manufacturers	0.379	0.486	0.1	.1
	Canvas products manufacturers				

TABLE B.14 continued

Industry size group		Capital's share		Percentage of total gross value added	
Code	Name	1970	1974	1970	1974
188	Automobile fabric accessories industry	0.516	0.493	0.3	0.3
189	Thread mills	0.454	0.491	0.7	0.7
	Narrow fabric mills				
	Embroidery, pleating & hemstitching manufacturers				
	Textile dyeing & finishing plants				
	Miscellaneous textile industries, NES				
231	Hoisery mills	0.393	0.380	0.3	0.1
239	Knitted fabric manufacturers	0.406	0.416	0.6	0.6
	Other knitting mills				
243	Men's clothing factories	0.333	0.351	1.3	1.2
	Men's clothing contractors				
244	Women's clothing factories	0.367	0.401	1.2	1.1
	Women's clothing contractors				
245	Children's clothing industry	0.366	0.371	0.2	0.2
246	Fur goods industry	0.427	0.478	0.1	0.1
248	Foundation garment industry	0.359	0.386	0.2	0.1
249	Fabric glove manufacturers	0.355	0.411	0.1	0.1
	Hat and cap industry				
	Miscellaneous clothing industries, NCA				
251	Shingle mills	0.281	0.380	2.1	2.7
	Sawmills & planing mills				
252	Veneer and plywood mills	0.241	0.355	0.5	0.5
254	Sash, door & other millwork plants, etc.	0.400	0.471	0.7	1.0
	Hardwood flooring plants				
	Manufacturers of prefabricated buildings (wood frame construction)				
	Manufacturers of wooden kitchen cabinets				
256	Wooden box factories	0.393	0.401	0.1	0.1
258	Coffin & casket industry	0.312	0.352	0.0	0.0
259	Wood preservation industry	0.415	0.528	0.2	0.3
	Wood handles & turning industry				
	Manufacturers of particle board				
	Miscellaneous wood industries, NES				
261	Furniture reupholstery & repair shops	0.395	0.410	0.9	1.0
	Household furniture manufacturers, NES				

TABLE B.14 continued

Industry size group		Capital's share		Percentage of total gross value added	
Code	Name	1970	1974	1970	1974
264	Office furniture manufacturers	0.402	0.464	0.2	0.2
266	Miscellaneous furniture & fixtures manufacturers	0.393	0.435	0.6	0.5
268	Electric lamp & shade manufacturers	0.263	0.450	0.0	0.0
271	Pulp & paper mills	0.473	0.640	6.2	8.1
272	Asphalt roofing manufacturers	0.503	0.708	0.1	0.1
273	Folding carton & set box manufacturers	0.408	0.494	1.3	1.3
	Corrugated box manufacturers				
	Paper & plastics bag manufacturers				
274	Miscellaneous paper converters	0.454	0.534	0.9	0.9
286	Commercial printing	0.364	0.400	2.0	1.9
287	Platemaking, typesetting & trade bindery industry	0.286	0.312	0.3	0.3
288	Publishing only	0.594	0.625	0.0	0.6
289	Publishing & printing	0.452	0.479	2.0	1.8
291	Iron & steel mills	0.494	0.498	3.9	3.7
292	Steel pipe & tube mills	0.410	0.573	0.4	0.4
294	Iron foundries	0.348	0.466	0.6	0.6
295	Smelting & refining	0.478	0.472	2.7	2.1
296	Aluminum rolling, casting & extruding	0.391	0.554	0.4	0.4
297	Copper & copper alloy rolling, casting & extruding	0.436	0.546	0.2	0.2
298	Metal rolling, casting & extruding, NES	0.517	0.584	0.3	0.3
301	Boiler & plate works	0.345	0.404	0.4	0.5
302	Fabricated structural metal industry	0.434	0.539	1.3	1.4
303	Metal door & window manufacturers	0.421	0.487	0.7	0.7
	Ornamental & architectural metal industry, NES				
304	Metal coating industry	0.469	0.534	1.9	1.8
	Metal stamping & pressing industry				
305	Wire & wire products manufacturers	0.432	0.569	1.0	1.2
306	Hardware, tool & cutlery manufacturers	0.422	0.458	0.9	0.9
307	Heating equipment manufacturers	0.488	0.487	0.3	0.2
308	Machine shops	0.345	0.389	0.7	0.5
309	Miscellaneous metal fabricating industries	0.438	0.517	1.2	1.2
311	Agricultural implement industry	0.306	0.429	0.5	0.8

TABLE B.14 continued

Industry size group		Capital's share		Percentage of total gross value added	
Code	Name	1970	1974	1970	1974
315	Miscellaneous machinery & equipment manufacturers	0.444	0.482	3.3	3.2
316	Commercial refrigeration & air conditioning equipment manufacturers	0.488	0.466	0.2	0.2
318	Office & store machinery manufacturers	0.588	0.471	1.7	0.6
321	Aircraft & aircraft parts manufacturers	0.159	0.328	1.5	1.0
323	Motor vehicle manufacturers	0.572	0.660	4.1	5.3
324	Truck body manufacturers	0.416	0.434	0.5	0.8
	Non-commercial trailer manufacturers				
	Commercial trailer manufacturers				
325	Motor vehicle parts & accessories manufacturers	0.436	0.471	2.6	2.8
326	Railroad rolling stock industry	0.216	0.327	0.6	0.6
327	Shipbuilding & repair	0.216	0.327	0.6	0.6
328	Boatbuilding & repair	0.350	0.378	0.1	0.1
329	Miscellaneous vehicle manufacturers	0.632	0.356	0.5	0.1
331	Manufacturers of small electrical appliances	0.537	0.567	0.3	0.4
332	Manufacturers of major appliances (electric & non-electric)	0.443	0.538	0.6	0.7
333	Manufacturers of lighting fixtures	0.463	0.531	0.2	0.2
334	Manufacturers of household radio & television receivers	0.399	0.586	0.4	0.4
335	Communications equipment manufacturers	0.310	0.463	2.2	2.2
336	Manufacturers of electrical industrial equipment	0.356	0.411	1.5	1.4
338	Manufacturers of electric wire & cable	0.577	0.552	0.7	0.7
339	Battery manufacturers	0.488	0.544	0.7	0.7
	Manufacturers of miscellaneous electrical products, NES				
351	Clay products manufacturers (from domestic clays)	0.441	0.492	0.3	0.3
	Clay products manufacturers (from imported clays)				
352	Cement manufacturers	0.702	0.688	0.5	0.5
353	Stone products manufacturers	0.439	0.381	0.0	0.0

TABLE B.14 continued

Industry size group		Capital's share		Percentage of total gross value added	
Code	Name	1970	1974	1970	1974
354	Concrete pipe manufacturers Manufacturers of structural concrete products Concrete products manufacturers, NES	0.487	0.520	0.6	0.7
355	Ready-mix concrete manufacturers	0.528	0.553	0.5	0.6
356	Glass manufacturers Glass products manufacturers	0.447	0.511	0.7	0.7
357	Abrasives manufacturers	0.391	0.410	0.1	0.1
358	Lime manufacturers	0.615	0.660	0.1	0.1
359	Refractories manufacturers Miscellaneous non-metallic mineral products industries, NES	0.524	0.563	0.6	0.6
365	Petroleum refining Manufacturers of lubricating oils & greases	0.552	0.743	1.6	2.5
369	Miscellaneous petroleum & coal products industries	0.644	0.615	0.0	0.0
372	Manufacturers of mixed fertilizers	0.636	0.775	0.1	0.1
373	Manufacturers of plastics & synthetic resins	0.576	0.739	0.4	0.6
374	Manufacturers of pharmaceuticals & medicines	0.646	0.628	1.3	1.1
375	Paint & varnish manufacturers	0.528	0.623	0.6	0.6
376	Manufacturers of soap & cleaning compounds	0.656	0.666	0.7	0.6
377	Manufacturers of toilet preparations	0.680	0.693	0.5	0.5
378	Manufacturers of pigments & dry colours Manufacturers of industrial chemicals (inorganic), NES Manufacturers of industrial chemicals (organic), NES	0.540	0.687	2.2	2.3
379	Manufacturers of printing inks Miscellaneous chemicals industries, NES	0.464	0.571	1.1	1.1

TABLE B.14 continued

Industry size group		Capital's share		Percentage of total gross value added	
Code	Name	1970	1974	1970	1974
391	Instrument & related products manufacturers	0.473	0.500	1.1	1.0
	Clock & watch manufacturers				
	Orthopaedic & surgical appliance manufacturers				
	Ophthalmic goods manufacturers				
	Dental laboratories				
392	Jewellery & silverware industry	0.412	0.503	0.3	0.3
393	Sporting goods manufacturers	0.507	0.560	0.5	0.5
	Toys & games manufacturers				
397	Signs & displays industry	0.462	0.416	0.3	0.3
399	Broom, brush & mop manufacturers	0.468	0.514	1.0	0.8
	Button, Buckle & fastner manufacturers				
	Floor tile, linoleum & coated fabrics manufacturers				
	Sound recording & musical instrument manufacturers				
	Stamp & stencil (rubber & metal) manufacturers				
	Pen & pencil manufacturers				
	Typewriter supplies manufacturers				
	Fur dressing & dyeing				
	Other miscellaneous manufacturing industries				

NOTE: See note to Table B.13.

the other parameter values maintained, the relevant cost figures for Scenario 3d are \$10.25 for independent firms and \$10.22 for multinational firms.

In the tables attention is restricted to settings where the distribution parameter for labour or the value-added term (the distribution for capital or the other factor is one minus the distribution parameter for labour) is 0.5 or 0.75. These values register the relative degree of factor intensity for the production process. Thus, the production of X and I are equally labour- (or capital-) intensive. Three values are chosen for the elasticities of substitution, 0.01 to represent nearly fixed technological coefficients in production, 0.99 to represent nearly the Cobb-Douglas production structure,¹ and 2.5 to represent a greater degree of substitutability.²

Tables B.5 and B.6 report summary statistics for all values of the parameters in this numerical experiment. To compare the response of independent and multinational firms to the imposition of tariffs where multinational transactions are evaluated at accounting cost plus a markup of 15 per cent, consider the last columns of Tables B.5 and B.6 for Scenario 2b. These reveal that the incidence of least-cost solutions in Canada is constant for independent firms when firms are organized either independently or have the option of being organized as multinationals separated by a border. Comparison of the first two columns in Tables B.5 and B.6 for Scenario 2b reveals that when firms have the option of organizing multinationally Canadian customs valuation procedures have a tendency to increase slightly the incidence of production exclusively in the United States.

For the parameters selected for the value-added calculations, a comparison of Scenario 2 in Table B.7 with Scenario 2b in Table B.9 and Scenario 2 in Table B.8 with Scenario 2b in Table B.11 reveals little variation between the two forms of organization.

Not surprisingly, comparison across the tariff values for Scenario 2b in Table B.6 suggests that larger tariffs on final commodities increase the incidence of exclusive production in Canada for the Canadian market. An increase in the

1 These two elasticities of substitution could not be set equal to 0 and 1 exactly because of the mathematical limiting difficulties as $\sigma \rightarrow 0, 1$ for the CES production function.

2 Griliches and Ringstad (1971, 121-3) estimate a similar CES production function for aggregate Norwegian manufacturing data and obtain estimates of the distributional parameter for I of 0.79, the elasticity of substitution σ_Q of 1.7, and the degree of homogeneity of the production function of 1.027. We permit variation of these distributional and elasticity parameters to coincide with possibilities at a more disaggregated level of production.

tariff in semifinished commodities appears to increase the incidence of production exclusively in the United States or Canada.

A comparison of Scenario 1 and 2b reveals the obvious import-substitution effect of the Canadian tariffs. One exception is found in Table B.9 for $\sigma_X = 0.01$, $\sigma_I = 2.5$, $\sigma_Q = 2.5$, and $a_X = a_I = a_Q = 0.5$, where the least-cost free-trade, multicountry solution becomes a post-tariff, exclusively US solution. The explanation of this appears to be that for these parameter values, equally capital- and labour-intensive in the final stages of production, elasticities of substitution of 2.5 are sufficiently high, given the relative factor prices (capital relatively cheaper in the United States, labour relatively cheaper in Canada), that the higher tariff on finished commodities does not compensate for the US cost advantage.

A higher US tax on corporate profits in the presence of the binding constraint by US tax authorities that for multinational corporations gross margins in the United States be at least as great as gross margins in Canada (Scenario 3c, the *Eli Lilly* rule) not surprisingly increases the incidence of least-cost solutions that involve at least some production in Canada. This may be seen by comparing the incidence of least-cost solutions across jurisdictions in Table B.3 for Scenario 3c for the two tax possibilities.

A comparison of value-added calculations for distributional parameters of 0.5, together with the other standard parameter values for independents (Scenario 3, Table B.7) and multinationals (Scenario 3c, Table B.9), indicates that the multinational option, even in the presence of binding US tax rules on the location of reported revenues, tends to increase the employment of resources in Canada. Of the twenty-seven production calculations, all of which yield exclusive production in the United States for the independent case, thirteen yield some Canadian production if multinationals are permitted, with employment in value-added terms of labour from 16.2 to 31.1 per cent and of capital from 6.8 to 13.1 per cent. This is simply a manifestation of the propensity of multinationals to erode the effect of fiscal legislation by transfer pricing.

A comparison of value-added calculations for distributional parameters of 0.75, together with the other standard parameter values for independents (Scenario 3, Table B.8) and multinationals (Scenario 3c, Table B.11), indicates that the imposition of the *Eli Lilly* rule on multinationals relative to independents tends to leave relative percentage value-added terms unchanged where production is located in the two countries. For some elasticity values ($\sigma_X = 0.99$, $\sigma_I = 2.5$, $\sigma_Q = 0.01$, 0.99 , 2.5 ; $\sigma_X = 2.5$, $\sigma_I = 0.99$, $\sigma_Q = 0.01$, 0.99 , 2.5), exclusive Canadian production under the independent firm scenario becomes US-Canadian multinational production for the multinational firm scenario. This

reduces the employment of labour and capital in Canada as well as Canadian tax payments on corporate profits.

A higher US tax on corporate profits in the presence of arbitrary valuation rules of the type used by Canadian income tax authorities on non-arm's-length transactions between affiliates separated by a border increases the incidence of least-cost solutions exclusively in Canada. To see this, compare the two US tax rate values in Scenario 3d, Table B.6.

In comparison with independent firms, the impact of arbitrary valuation rules on multinational transactions of the type used by Canadian income tax authorities does not appear systematic. From Tables B.5 and B.6, Scenarios 3 and 3d respectively, the imposition of such rules on multinationals increases the incidence of exclusively US firms and multinationals where the first stage of production takes place in Canada, and decreases the incidence of exclusively Canadian firms and multinationals where the first stage of production takes place in the United States.

A comparison of the value-added terms for Scenario 3 in Table B.7 and Scenario 3d in Table B.10 indicates that for distributional parameters of 0.5, together with the other selected parameter values, there are identical patterns of resource employment in percentage value-added terms.

A comparison of the value-added terms for Scenario 3 in Table B.8 with Scenario 3d in Table B.12 indicates that for distributional parameters of 0.75, together with the other selected parameter values, there are nearly identical patterns of resource employment in percentage value-added terms. Values of $\sigma_X = 2.5$, $\sigma_I = 0.99$, $\sigma_Q = 0.01$ and 0.99 present the sole exception for these parameter values. Here, under arbitrary valuation by Canadian income tax rules, there is more shifting of the final stage of production from Canada to the United States by multinationals than by independents. As a proportion of final per-unit cost in Canada, value-added by labour and capital drops from 82 and 8 per cent to approximately 36 and 1 per cent respectively.

Final comparisons involve the simultaneous imposition of corporate profit taxes with arbitrary capital cost allowances and tariffs on arbitrary valuations for transfers between affiliated firms. Equal corporate profit tax rates between two jurisdictions leave a multinational indifferent on tax grounds about where it reports its profits. In this case a rule such as the *Eli Lilly* rule may be invoked to yield a determinate allocation to the location of reported profits. However, when corporate profit rates are higher in one jurisdiction than another, the rule becomes binding in the region with the higher tax rate. Thus, for discussion purposes, we restrict our attention to Scenario 4c for multinationals where $t_u = 0.51$ and $t_c = 0.46$. Comparing corresponding cases for independent and multinational options for these tax rates from Tables B.5 and B.6, we see that

the imposition of the *Eli Lilly* rule reduces the incidence of exclusively Canadian or US firms and increases the incidence of multinational operations. This holds over the calculated tariff rates.

Of the twenty-seven reported tabulations for independent firms for $a_X = a_I = a_Q = 0.50$ (Scenario 4, Table B.7), twelve involve trade across the Canada-United States border, nine are exclusively Canadian operations, and six are exclusively American. Of the twenty-seven reported tabulations for multinationals $a_X = a_I = a_Q = 0.50$ (Scenario 4c, Table B.10), twenty involve multinational operations and seven are exclusively Canadian.

Independent Canadian operations that become multinational under the *Eli Lilly* rule and tariffs obviously involve a shifting of the employment of resources to the United States. International operations that change from independent to multinational do not alter substantially the value-added by labour and capital in Canada as a percentage of the final per unit cost. There are six cases ($\sigma_X = 0.99, \sigma_I = 2.5, \sigma_Q = 0.01, 0.99, 2.5$; $\sigma_X = 2.5, \sigma_I = 2.5, \sigma_Q = 0.01, 0.99, 2.5$) where exclusively US independents become multinationals with the final stages of production in Canada. These cases involve relatively high elasticities of substitution between capital and labour in the I term.

For production functions that are more labour-intensive ($a_X = a_I = 0.75$) as well as non-intensive in semifinished goods, ($a_Q = 0.75$), Scenario 4, Table B.8, reveals that independents choose to produce exclusively in Canada, where labour relative to capital is cheaper (the *Eli Lilly* rule), while multinational possibilities shift some activity into the United States (eight of twenty-seven cases).

Finally, the imposition of tariffs and taxes where tariff valuations are accepted for tax purposes and there is a differential corporate tax rate has a significant impact in shifting production into Canada. To see this, compare Scenario 4, Table B.5, and Scenario 4d, Table B.6. In the latter no production of the semifinished commodity X takes place in the United States.

For the distribution parameters $a_X = a_I = 0.5$ Table B.7 reveals that of the twenty-seven independent firm solutions nine are exclusively Canadian, twelve are international, and six are exclusively American. From Table B.10, under tariffs and differential corporate taxes with tariff valuations for tax purposes, the possibility of multinational organization shifts nine international cases to exclusively Canadian production. For $\sigma_X = 2.5, \sigma_I = 0.99, \sigma_Q = 0.01, 0.99, 2.5$, production shifts back to the United States.

For the distribution parameters $a_X = a_I = a_Q = 0.75$, under tariffs and differential corporate taxes, the multinational possibility does not alter the production process, which remains exclusively Canadian.

The tabulations presented in these tables demonstrate some variability in terms of location of the least-cost configuration of outputs and value-added by

capital and labour to service the Canadian market as we move from the solution which compels firms to be independent to that which allows firms to be multinationals. There is consistency in the tables in the sense that differential tax rates encourage production in the low-tax country and appropriate tariff barriers increase domestic production. To analyse the impact of the multinational as against that of the independent form of organization for Canada requires information on the production processes used by specific Canadian industries. This information would provide not only specific parameter estimates but a test of the weak separability of our CES production function. Unfortunately, such detailed information does not exist for Canadian industries.

SELECTION OF SPECIFIC COSTS RELEVANT TO CANADA

From this collection of least-cost industrial structures it is reasonable to ask which are most relevant to Canada.

Tables B.13 and B.14 report capital's share in three-digit manufacturing industries in Canada for a sample of 112 industry-size groups. In 1970 and 1974 respectively, 64 and 73 industries of the total sample (about 60 per cent) have capital's share, as we have calculated it, between 0.401 and 0.6. These industries represent between 56 and 59 per cent of total gross value-added in the sample.

With these facts in mind it is reasonable to concentrate on two scenarios. For both, we consider elasticities of substitution between capital and labour in the two stages of production of 0.99 and a distribution parameter on capital of 0.5. (As noted above, production functions whose elasticities of substitution are one permit a closer correspondence between distribution parameters and factor shares in production.) The difference between these scenarios is the value we impute in the final production process to the substitutability between the semi-finished output of stage one and the value-added by capital and labour at the final stage.

There appear to be two reasonable values bounding the possibilities. The first possibility is that there is virtually no substitution in the final stage between semifinished goods and value-added. (e.g. products manufactured at stage one are packaged at stage two). The second is that there is significant substitutability at the final stages (e.g. automobile components may be moved to the 'final' assembly stage process at several stages of completion). Corresponding to the first possibility, we fix σ_Q at 0.01; corresponding to the second possibility, we fix σ_Q at 2.5. Griliches and Ringstad (1971) at the industry level using Norwegian data find it difficult to reject the Cobb-Douglas specification ($\sigma_X = \sigma_I = 0.99$). They use a production function assumed to be strongly separable between materials and capital and labour. Further, their estimates of a_I vary from 0.42 to 0.79.

Observations on comparative industrial structures under market-based transfer prices and artificial prices come straightforwardly from Tables B.1, B.3, B.7, B.9, and B.10.

For the case of no substitutability in the final production process ($\sigma_Q = 0.01$), only the application of cost markup transfer price rules used by the Canadian Income Tax Act (Case 4d) causes any deviation between the industrial structure arising from market prices and the industrial structure involving valuation rules for non-arm's-length transactions. The effect is to move primary production out of the United States into Canada. This increases value-added as a percentage of final minimum unit cost for labour from 25.2 to 50 per cent and for capital from 10.5 to 20.9 per cent. Obviously tariff revenues disappear in this change, but Canadian corporate income taxes as a percentage of final minimum unit cost increase from 14 to 28.7 per cent.

For the case of significant substitutability in the final process between value added at that stage and value added at the earlier stage ($\sigma_Q = 2.5$), there are two scenarios where changes occur between the market-price solution and the non-arm's-length solution. First, in the scenario with free trade and tax with the *Eli Lilly* rule for US evaluation (Case 3c), the independent firm solution involves exclusive production in the United States. The application of the *Eli Lilly* rule to any non-arm's-length transactions in the United States causes production in the final stage to shift to Canada. This increases value added as a percentage of final minimum unit cost for labour from 0 to 21.5 per cent and for capital from 0 to 8.8 per cent. Further, Canadian taxes as a percentage of minimum unit cost increase from 0 to 12.2 per cent (Case 3 is with free trade, so no tariff revenues are present).

Second, in the case of taxes and customs duties with transfer price rules used by the Canadian Income Tax Act (Case 4d), there is, for our selected parameter values, a change in the incidence of production between market-established prices and the appropriate non-arm's-length price rules. Again, these rules shift production, which had previously been split, with primary production occurring in the United States, to make it exclusively Canadian. Previously defined value-added measures for labour increase from 23.1 to 50.0 per cent and for capital increase from 10.1 to 20.9 per cent. Again, although tariff revenues disappear, tax revenues, previously defined, increase from 12.9 to 29.1 per cent.

To the extent that these cases serve as indicators of the distribution and substitution parameters that prevail in Canadian manufacturing industries, a strong statement on multinationals emerges. In the two cases discussed, a comparison between the industrial structure that emerges from market-established prices between independent firms and the structure forthcoming when we admit the possibility that multinational firms may exist with their potential ability to

manipulate fiscal transfer prices suggests that, in the face of existing rules, production shifts *into and not out of Canada*. Multinational production may exist, but it is the same industrial structure that would prevail in the presence of independent firms and market prices.

Admittedly, in the face of significant elasticities of substitution between final value-added and initial semifinished output, employment of factors of production may shift away from Canada. For example, in the last case considered ($\sigma_Q = 2.5$) the international industrial structure remains unchanged between market-determined prices and non-arm's-length prices in the face of taxes and tariffs with the *Eli Lilly* rule in effect. That structure dictates that the first stage of production is in the United States with the final stage in Canada. However, value-added in Canada by labour as a percentage of final minimum unit cost drops from 24.7 to 23 per cent; the corresponding drop for capital is 10.3 to 9.6 per cent; Canadian corporate income taxes fall from 14.6 to 13.4 per cent; with increased value added in the United States, tariffs increase from 4.6 to 4.9 per cent. These changes do not appear to be large.

Although we would not like to rest any case on the basis of two scenarios selected from such casual evidence, the impact of the multinational option does not appear to be large. Further, until we have a great deal more evidence on the production structure at the industry level, the use of pseudo-empirical techniques along the lines shown here appears to be the best utilization of whatever industry data we have.

One final caveat remains. It is our view that the numbers presented in these tabulations have some interest for the policy-maker trying to assess the impact of varying policies on firm organization, on the location of industries of differing capital and labour intensities and differing elasticities of substitution, and consequently on the employment of factors of production. However, there is nothing normative about these numbers. In the absence of any utility function or social welfare indicator it is not possible to say which of these production possibilities is best in the Pareto sense or in any other sense.

APPENDIX C

Possible incidence of transfer pricing problems – 1974

The tables which follow are intended to provide, not a measure of the extent of transfer price manipulation, but a first estimate of the volume of trade in commodities where market structure suggests there is scope for such manipulation. As the text indicates, such pricing is apt to occur and to pose problems only where markets are dominated by multinational firms and where there is a significant volume of trade in intermediate or unfinished products but where there are no significant markets in which the intermediate product is sold in appreciable volumes to third parties. Unless these conditions are met, there will be adequate information on true market values which should avoid the need to use constructed or internally administered transfer prices. The first column in these tables identifies industries in which multinational firms are of limited importance, the second those in which multinationals are important but where intermediate products are marketed in sufficient quantity that market prices are observable. Only those commodities classified in the third column pose a problem; it must be noted that, to the extent that transactions involve end products for which markets presumably exist, the present classification grossly overestimates the potential incidence of pricing problems.

It should also be noted that the classification is of commodity groups as reported by Statistics Canada and not of individual commodities. Since in some instances market organization differs within different parts of the group, it was necessary to rely on a judgmental classification of the group as a whole. Where there was doubt, say, between column 1 and column 2 or between column 2 and column 3, the commodity group was placed in the higher-numbered column. The

figures, summarized in the table following, suggest that in 1974 some 43.7 per cent of Canada's exports and 42.0 per cent of her imports consisted of products of industries in which there existed potential for transfer-pricing problems. Since much of this trade was in end products of the industries in question, the potential scope for transfer pricing was much smaller than these figures indicate. Over-all, therefore, transfer pricing seems to be a relatively insignificant problem. However, as the details in the tables will reveal, the problem is most likely to occur in those manufacturing industries which are believed to be underdeveloped in Canada and to be appropriate targets for an 'industrial strategy.'

Tables C.1 and C.2 may be summarized with the following totals (\$ millions):

	Multinationals unimportant	Multinationals important	
		Intermediate markets	No intermediate markets
Exports	7,213.2	10,315.8	13,631.7
Imports	4,014.9	13,968.4	13,019.2

TABLE C.1

Importance of multinational firms in Canadian export trade (\$ millions)

Exports	Multi- nationals unimportant	Multinationals important	
		Inter- mediate markets	No intermediate markets
Live animals	89.3	—	—
Meat, fresh chilled, frozen	133.3	—	—
Other meat and meat preparations	—	17.0	—
Fish, whole or dressed	82.6	—	—
Fish, fillets, and blocks	111.5	—	—
Fish, preserved	43.7	—	—
Fish, canned	63.1	—	—
Shellfish	70.5	—	—
Dairy products, eggs, and honey	76.5	—	—
Barley	323.4	—	—
Wheat	2,041.2	—	—
Other cereals, unmilled	23.6	—	—
Wheat flour	52.8	—	—
Other cereals, milled	40.0	—	—
Cereal preparations	—	42.2	—
Fruits and fruit preparation	—	30.2	—
Vegetables and veg. preparations	—	75.7	—
Sugar and sugar preparations	—	42.6	—
Other foods	75.8	—	—
Oilseed cake and meal	20.8	—	—
Other feeds, vegetable origin	40.0	—	—
Other fodder and feed	46.9	—	—
Whiskey	—	193.7	—
Other beverages	—	12.5	—
Tobacco	—	75.3	—
Raw hides and skins	41.4	—	—
Fur skins, undressed	—	44.6	—
Other crude animal products	26.5	—	—
Seeds for sowing	24.6	—	—
Flaxseed	148.6	—	—
Rapeseed	199.8	—	—
Other oil seeds, nuts, & kernels	32.0	—	—
Other crude veg. products	34.3	—	—
Pulpwood	—	12.7	—
Pulpwood chips	—	—	14.3
Other crude wood products	—	—	36.3
Textile and related fibres	—	25.7	—
Iron ores and concentrates	—	542.6	—
Scrap iron and steel	31.3	—	—

TABLE C.1 continued

Exports	Multi-nationals unimportant	Multinationals important	
		Inter-mediate markets	No intermediate markets
Aluminum ores and scrap	—	—	33.6
Copper in ores, etc.	—	647.0	—
Lead in ores, etc.	64.5	—	—
Nickel in ores, etc.	—	—	438.2
Precious metals, ores, etc.	146.3	—	—
Zinc, ores, etc.	—	318.9	—
Radioactive ores, etc.	51.3	—	—
Other metals, ores, etc.	—	98.2	—
Crude petroleum	—	3,408.5	—
Natural gas	493.6	—	—
Coal, etc.	319.1	—	—
Asbestos, raw	—	—	335.9
Sulphur	—	91.0	—
Other crude non-metallic minerals	—	80.0	—
Other wastes, scrap, etc.	23.6	—	—
Leather and leather products	10.9	—	—
Lumber, softwood	—	1,253.6	—
Lumber, hardwood	35.6	—	—
Shingles and shakes	—	54.3	—
Other sawmill products	—	10.5	—
Veneer	—	43.4	—
Plywood	—	61.4	—
Other wood-fabricated materials	—	34.2	—
Woodpulp, etc.	—	—	1,861.2
Newsprint paper	—	—	1,721.8
Other paper for printing	—	92.7	—
Paperboard	—	122.6	—
Other paper	—	179.0	—
Yarn, thread, cordage	21.3	—	—
Cotton fabrics	20.2	—	—
Other fabrics	31.8	—	—
Other textile materials	59.5	—	—
Oils, fats, waxes, etc.	—	74.9	—
Chemical elements	—	86.9	—
Other inorganic chemicals	—	145.7	—
Organic chemicals	—	122.3	—
Fertilizers	—	421.1	—
Synthetic rubber and plastics	—	101.9	—
Plastics, shapes and forms	—	—	43.6
Other chemical products	—	56.8	—

TABLE C.1 continued

Exports	Multi- nationals unimportant	Multinationals important	
		Inter- mediate markets	No intermediate markets
Petroleum and coal products	—	593.4	—
Ferro alloys	15.4	—	—
Primary iron and steel	115.6	—	—
Castings and forgings, steel	—	—	112.5
Bars and rods, steel	65.6	—	—
Plate, sheet, strip steel	193.6	—	—
Railroad tracks	24.3	—	—
Other iron and steel alloys	219.9	—	—
Aluminum	—	—	505.8
Copper	—	644.5	—
Lead	39.5	—	—
Nickel	—	—	434.2
Precious metals	102.6	—	—
Zinc	—	226.3	—
Other non-ferrous metals	—	26.7	—
Metal-fabricated basic products	—	—	217.6
Abrasive basic products	—	—	65.8
Other non-metallic mineral prod.	101.3	—	—
Electricity	174.6	—	—
Other inedible materials	36.1	—	—
Engines & turbines, general purpose	—	—	47.0
Electric generators and motors	—	—	24.6
Other general purpose machinery	—	—	123.5
Materials handling equipment	—	—	130.0
Drilling, excavating, mining machinery	—	—	82.5
Metalworking machinery	—	—	71.1
Woodworking machinery	—	—	58.9
Construction machinery	—	—	46.2
Plastics industry machinery	—	—	57.9
Pulp and paper machinery	—	—	33.7
Other special machinery	—	—	75.0
Plows, discs, seed drills, etc.	—	—	66.1
Combines, reapers, etc.	—	—	132.5
Haying, etc., machinery	—	—	56.3
Tractors	—	—	76.7
Other agricultural machinery	—	—	65.7
Rolling stock	39.4	—	—
Passenger cars and chassis	—	—	2,649.1
Trucks and chassis	—	—	864.0
Other motor vehicles	—	—	114.8
Motor vehicle engines and parts	—	—	460.8

TABLE C.1 Continued

Exports	Multi-nationals unimportant	Multinationals important	
		Inter-mediate markets	No intermediate markets
Motor vehicle parts and accessories	—	—	1,490.0
Ships, boats, and parts	106.0	—	—
Aircraft, complete	55.2	—	—
Aircraft engines and parts	—	—	124.8
Aircraft parts, other	—	—	253.4
Other transport equipment	72.7	—	—
Television, radio, etc., sets	34.6	—	—
Other telecommunication equip.	—	—	318.4
Heating and refrig. equipment	—	45.2	—
Stores	8.7	—	—
Electric lighting and distribution equipment	—	—	105.4
Navigation equipment and parts	—	—	57.3
Other instruments	77.7	—	—
Hand tools and cutting	27.6	—	—
Office machines and equipment	—	—	217.0
Other equipment and tools	118.1	—	—
Apparel and accessories	127.4	—	—
Footwear	17.6	—	—
Toys, games, sporting goods	—	52.2	—
Other household goods	62.5	—	—
Medicinals and pharmaceuticals	—	—	40.5
Medical, ophthalmic, etc., supplies	—	—	12.8
Printed matter	64.6	—	—
Photographic goods	—	42.1	—
Firearms and ammunition	—	26.6	—
Containers, etc.	—	39.1	—
Prefab buildings and structures	59.9	—	—
Other end products	101.5	—	—
Total	7,213.2	10,315.8	13,631.7

TABLE C.2

Importance of multinational firms in Canadian import trade (\$ million)

Exports	Multi- nationals unimportant	Multinationals important	
		Inter- mediate markets	No intermediate markets
Live animals	109.2	—	—
Meat, fresh, chilled, frozen	168.9	—	—
Other meat and meat preparations	—	26.3	—
Dairy produce, eggs, honey	—	86.5	—
Indian corn, shelled	149.2	—	—
Other cereals and preparations	—	95.4	—
Bananas and plantains, fresh	—	42.0	—
Grapes, fresh	41.0	—	—
Oranges, fresh	48.7	—	—
Other fresh fruits, berries	101.3	—	—
Dried, dehydrated fruits	28.3	—	—
Orange juice and concentrates	36.4	—	—
Other fruit juices	—	18.1	—
Fruits, canned	—	48.0	—
Other fruit preparations	24.4	—	—
Nuts	44.6	—	—
Tomatoes	37.3	—	—
Other fresh vegetables	126.8	—	—
Other vegetables and preparations	—	97.1	—
Raw sugar	—	396.0	—
Refined sugar, molasses, syrups	—	57.3	—
Sugar preparations and confectionery	—	48.9	—
Cocoa and chocolate	—	50.5	—
Coffee	—	131.1	—
Tea	—	30.4	—
Other foods	—	104.5	—
Oilseed cake and meal	51.4	—	—
Other fodder and feed	—	28.6	—
Distilled beverages	—	68.7	—
Other beverages	71.7	—	—
Tobacco	19.4	—	—
Fur skins, undressed	58.7	—	—
Other crude animal products	31.8	—	—
Soyabeans	90.5	—	—
Other oilseeds, nuts, and kernels	40.7	—	—
Rubber and gums, natural	—	46.5	—
Other crude vegetable products	60.5	—	—
Crude wood materials	—	73.3	—

TABLE C.2 Continued

Exports	Multi- nationals unimportant	Multinational important	
		Inter- mediate markets	No intermediate markets
Wool and animal hair	28.0	—	—
Cotton	73.1	—	—
Man-made fibres	—	—	56.2
Other fibres	4.7	—	—
Iron ore and concentrates	37.0	—	—
Scrap iron and steel	56.3	—	—
Aluminum ores and concentrates	—	—	114.8
Other ores	—	186.3	—
Coal	302.4	—	—
Crude petroleum	—	2,642.8	—
Asphalt, etc.	—	6.4	—
Abrasives, natural	—	12.5	—
Phosphate rock	—	40.1	—
Other crude non-metallics	66.7	—	—
Other scrap and waste	37.7	—	—
Leather and leather materials	65.0	—	—
Rubber-fabricated materials	—	73.2	—
Lumber	—	116.8	—
Veneer	—	21.0	—
Plywood and building board (wood)	—	125.8	—
Other wood materials	—	70.6	—
Woodpulp, etc.	—	—	19.4
Paper and paperboard	—	206.7	—
Cotton yarn and thread	—	23.9	—
Synthetic yarn and thread	—	125.5	—
Other yarn and thread	22.3	—	—
Cordage, twine, and rope	61.3	—	—
Wool and hair fabrics	—	17.2	—
Cotton fabrics	—	132.5	—
Synthetic fabrics	—	75.8	—
Fabrics, mixed fibres	—	106.6	—
Other fabrics	—	26.8	—
Other textile materials	—	128.8	—
Vegetable oils and fats	—	98.1	—
Other fats, waxes, etc.	—	60.8	—
Inorganic chemicals	—	—	160.0
Organic chemicals	—	—	355.9
Fertilizers, etc.	—	33.5	—
Synthetic and reclaimed rubber	—	60.5	—
Plastics materials	—	—	347.3

TABLE C.2 continued

Exports	Multi- nationals unimportant	Multinationals important	
		Inter- mediate markets	No intermediate markets
Plastic film and sheet	—	—	97.4
Other plastics, basic shapes & form	—	—	79.0
Dyestuffs	—	—	46.2
Pigments, lakes, and toners	—	32.2	—
Plants and related products	—	37.4	—
Other chemical products	—	—	287.3
Fuel oil	—	234.5	—
Lubricating oils and grease	—	48.7	—
Coke	—	52.9	—
Other petroleum and coal products	—	33.6	—
Bars and rods, steel	247.6	—	—
Plate, sheet, and strip steel	470.2	—	—
Structural shapes and sheet piling, steel	183.8	—	—
Pipes and tubes, steel	149.5	—	—
Wire and wire rope, steel	68.8	—	—
Other iron and steel/alloys	—	138.2	—
Aluminum and alloys	—	173.9	—
Copper and alloys	—	96.7	—
Nickel and alloys	—	92.3	—
Precision metals	135.1	—	—
Tin	43.1	—	—
Other non-ferrous metals & alloys	59.0	—	—
Bolts, nuts, and screws	104.1	—	—
Other basic hardware	—	121.1	—
Chains	30.6	—	—
Valves	—	78.6	—
Pipe fittings	75.6	—	—
Other metal basic products	—	152.1	—
Clay bricks, tiles, etc.	90.4	—	—
Sheet and plate glass	—	36.4	—
Other glass basic products	—	51.9	—
Abrasive basic products	—	39.3	—
Natural and synthetic gems	35.8	—	—
Other non-metallic basic products	78.3	—	—
Electricity	3.9	—	—
Other fabricated materials, inedible	—	129.3	—
Diesel engines, general purpose	—	58.6	—
Engines and turbines, general purpose, NCS	—	98.5	—
Electric generators and motors	—	107.5	139.7

TABLE C.2 continued

Exports	Multi-nationals unimportant	Multinationals important	
		Inter-mediate markets	No intermediate markets
Bearings	—	107.5	—
Other mechanical power transmission equipment	—	88.9	—
Compressors, blowers, vacuum purposes	—	80.8	—
Pumps, except oil well	—	56.1	—
Packaging machinery	—	—	50.4
Other general purpose machinery	132.4	—	—
Conveyors	—	23.4	—
Elevators and escalators	—	—	14.8
Industrial trucks, tractors, etc.	—	103.4	—
Hoisting machinery	—	97.8	—
Other material-handling equipment	—	89.4	—
Drilling machinery and bits	—	113.5	—
Power shovels	—	110.6	—
Bulldozers, etc.	—	18.3	—
Front-end loaders	—	120.6	—
Other excavating machines	—	64.2	—
Mining, oil and gas machinery	—	104.9	—
Construction and maintenance machinery	—	110.6	—
Machine tools, metalworking	—	147.4	—
Welding apparatus and equipment	—	38.5	—
Rolling mill machinery	—	34.3	—
Other metalworking machinery	—	114.5	—
Pulp and paper machinery	—	62.7	—
Printing presses	—	47.9	—
Other printing machinery	—	55.5	—
Spinning, weaving, knitting machinery	—	44.9	—
Other textile machinery	—	64.1	—
Food, beverage, and tobacco machinery	—	60.4	—
Plaster and chemical machinery	—	62.5	—
Other special machinery	—	—	200.8
Plows, discs, seed drills, etc.	—	—	59.9
Combine reaper-threshers	—	—	55.3
Other haying & harvesting machinery	—	—	104.7
Other agricultural machinery	—	—	134.3
Wheel tractors, new	—	252.9	—
Track tractors	—	114.9	—
Tractor engines and parts	—	—	178.3

TABLE C.2 continued

Exports	Multi- nationals unimportant	Multinationals important	
		Inter- mediate markets	No intermediate markets
Railway rolling stock	—	83.7	—
Passenger automobiles and chassis	—	—	2,012.4
Trucks and chassis	—	—	826.7
Other motor vehicles	—	—	280.9
Motor vehicle engines	—	—	396.8
Motor vehicle engine parts	—	—	332.7
Motor vehicle parts, except engines	—	—	3,132.3
Marine engines and parts	—	—	91.3
Ships, boats and parts, except engines	—	105.4	—
Aircraft complete	—	337.2	—
Aircraft engines and parts	—	—	124.8
Aircraft parts, except engines	—	—	166.4
Other transport equipment	—	—	358.1
Telephone and telegraph equipment	—	—	85.9
Television and radio, etc., sets	—	264.9	—
Electronic tubes and transistors	—	143.5	—
Other telecommunication equipment	—	—	461.6
Air conditioning and refrigeration equipment	—	—	189.7
Electric lighting fixtures & portable lamps	—	88.1	—
Switchgear and protective equipment	—	—	52.2
Industrial control equipment	—	—	45.6
Other electric lighting equipment	—	—	112.5
Auxiliary electric equipment	—	—	104.2
Electric property-measuring instruments	—	—	54.3
Miscellaneous measuring & control equipment	—	—	85.0
Medical and related equipment	—	—	77.7
Navigation equipment	—	—	12.0
Other lab, etc., equipment	—	—	206.9
Safety and sanitation equipment	—	57.7	—
Service industry equipment	—	65.6	—
Furniture and fixtures	—	158.9	—
Hand tools and cutlery	—	172.3	—
Electronic computers	—	—	331.3
Other office machines	—	—	275.4
Misc. equipment and tools	—	—	437.8
Outerwear, exc. knitted	—	170.3	—
Outerwear, knitted	—	151.4	—

TABLE C.2 continued

		Multinationals important	
		Inter- mediate markets	No intermediate markets
Exports			
Other apparel and accessories	—	119.6	—
Footwear	—	136.5	—
Watches, jewellery, silverware	—	101.6	—
Sporting & recreation equipment	—	101.2	—
Games, toys, and childrens vehicles	—	78.6	—
House furnishings	—	130.2	—
Kitchen utensils and tableware	—	132.8	—
Other personal household goods	—	159.3	—
Medicinals & pharmaceuticals	—	—	145.0
Medical, ophthalmic, etc., supplies	—	—	118.0
Newspapers, magazines, periodicals	—	99.2	—
Books and pamphlets	—	172.4	—
Other printed matter	101.4	—	—
Stationers & office supplies	—	82.1	—
Photographic film & plates	—	95.1	—
Other photographic goods	—	263.5	—
Containers and closures	—	139.7	—
Other end products	—	313.0	—
Total	4,014.9	13,968.4	13,019.2

Production-decision program description

The program used for the calculations reported in Appendix B is a reasonably straightforward Fortran program, built around a function CPERU. This function, given wage and capital costs and two parameters (α and σ), computes the CES cost function per unit of output, the amounts of labour and capital used per unit of output, and the capital/labour ratio.

Since each stage of the production process — ‘semifinished’ X , ‘assembly’ I , and final Q — is assumed to follow a CES form, we can use CPRRU to get costs for producing X in the United States and in Canada, costs for producing I in the United States and Canada, and costs for producing Q using either US or Canadian X and US or Canadian I .

The lowest-cost case (in terms of final cost to Canadian consumers, including tariffs) is analysed to determine the breakdown of value added in the production process between the United States and Canada and between wages, capital, taxes, and tariffs, and the results, for various values of α and σ , are printed out.

The situation is complicated by the existence of three different tax-and-tariff rules. The simplest, which we call the ‘independent firms’ case, has a tariff on good X levied on its economic cost, that is, the price at which it would sell on an open competitive market. The second, applicable to multinational firms in a no-tax situation or without restraint of foreign subsidiary taxes, has good X valued, for both tariff and tax-deduction purposes, at a 15 per cent markup over the value of the labour and capital used to produce it. The third case, for multinational firms operating under the *Eli Lilly* rule, is quite complex and requires an iterative process to determine the optimal spatial and labour/capital mix of techniques.

The value-added breakdown is done by keeping watch over several key variables in the production process. These are

PCOSTX, PCOSTI, PCOSTQ — the economic costs (including taxes) of *producing* X , I , and Q ;

LOPTX, LOPTI, KOPTX, KOPTI — the labour and capital used per unit of X and I ;

IOPT, XOPT — the amounts of I and X used to produce Q ;

CVALX, CVALQ — the customs valuation of X and Q .

They are used to compute wages, capital costs, and tariffs in the production process; taxes are computed as a residual. To simplify the logic and allow one algorithm to be used for all spatial cases, we have introduced two on-off arrays: EQUAL (I, J) is one if $I = J$ and zero if $I \neq J$; BORDER (I, J) is one if $I \neq J$, and zero if $I = J$.

A properly designed program would have all three cases included. Since this program was written in haste, separate segments were written and shuffled into the program deck as needed, starting at statement number 50 and ending just before statement number 80. In addition, the printout heading (set on Format statement 1050) should be changed. All three sets of statements are included in the program listing.

The tax and tariff rates are set at the beginning of the program in DATA statements. Note that the values used for R and TSTAR are different in the tax and no-tax cases. Relevant values are given in the miscellaneous cards at the end of the listing.

The program as listed will produce costing-out decision for 1000 cases of a and σ under the *Ely Lilly* rule with no tariffs, and will not print the value-added breakdown. To introduce tariffs, substitute

```
DO 200 IDUTYX = 1, 2,
DO 200 IDUTYQ = 1, 2,
for the cards
  IDUTYX = 1,
  ⋮
  DUTYQ(1) = 0.
```

To use different tax rates, substitute one of the TAXRAT DATA cards in the miscellaneous-card listing for the one in the program. To print the value-added breakdown, as used in appendix B, first remove the C in column 1 of the two cards before statement number 1020; second, remove the statement

```
DO 190 IAI = 1, NALPHA,
and
DO 180 IAQ = 1, NALPHA;
```

third, substitute

```
DATA NALPHA, NSIGMA/2, 3/  
DATA ALPHA / .5, .75/ , SIGMA / .01, .99, 2.5, 0.0, 0.0 /
```

for the watching DATA statements in the program listing.

The program runs reasonably fast and uses very little core storage. The major cost on the University of Toronto computer was on lines printed.

For the complete computer program see Figure D.1, beginning on the following page.

Figure D.1
Production-decision program

```

        DIMENSION ALPHA(2),SIGMA(5),WAGE(2),CAPCST(2),CNAME(2),STORE(2,5,
$          2)
        DIMENSION R(2),RSTAR(2)
        DIMENSION TOTCST(2,2)
        DIMENSION ALLOWST(2,2)
        DIMENSION ICOUNT(2,2)
        INTEGER US,CANADA
        REAL*4 MARKUP,DUTYX(2),DUTYQ(2),BORDER(2,2)
        REAL*4 EQUAL(2,2),RBASE(2),SUM(2)
        REAL*4 WAGES(2),CAP(2),TARIFF(2),TAXES(2)
        REAL*4 LOPTX,KOPTX,LOPTI,KOPTI,IOPT,XOPT
        REAL LABOR,LOPT,K, KOPT
        DIMENSION TAXRAT(2),T(2)
        EQUIVALENCE(TAXRAT(1),T(1))
        REAL*8 CNAME
        DATA NALPHA,NSIGMA/2,5/
        DATA A_PHA/.5,.75/, SIGMA/.01,.5,.99,1.5,2.5/
        DATA WAGE /4.36,3.62/
        DATA TAXRAT/.46,.46/,R/1.34,2.03/,RSTAR/.44,.37/
        DATA RBASE/1.0,1.44/
        DATA MARKUP/.15/, DUTYX/.1,.2/, DUTYQ/.15,.20/
        DATA BORDER / 0.0,1.0,1.0, 0.0/
        DATA EQUAL /1.0,0.0,0.0,1.0/
        DATA CNAME/ ' U.S. ','CANADA'/, US/1/, CANADA/2/
        DATA BLANK, ASTER/' ','*'/
C      ARITH STATEMENT FCN FOR PERCENT OF V.A. OF TOTAL COST
        PERC(A) = 100*A/CSTMIN
C      NO-DUTY CASE
        IDUTYX = 1
        IDUTYQ = 1
        DUTYX(1)=0
        DUTYQ(1) = 0
        WRITE(6,1050)TAXRAT,DUTYX(IDUTYX),DUTYQ(IDUTYQ)
1050  FORMAT(///'1SCENARIO 4 -- ELI LILLY RULE -- ',
        1      /, 'TAXRAT(US,CANADA)=' ,2F6.3, ' DUTY(X, Q)=' ,2F5.2//)
        DO 20 I = 1,2
        DO 20 J=1,2
        20  ICOUNT(I,J)=0
        DO 190 IAX = 1,NALPHA
        DO 190 ISIGX = 1,NSIGMA
        AX = ALPHA(IAX)
C      SET ALL ALPHAS TOGETHER
        IAI = IAX
        IAQ = IAX
C
        SIGX = SIGMA(ISIGX)
C      NOW WE KNOW THE PROD FCN FOR GOOD X.
C      POSTPONE DECISION ABOUT WHERE IT IS PRODUCED.
C
        DO 190 IAI = 1,NALPHA
        DO 190 ISIGI = 1,NSIGMA
        AI = ALPHA(IAI)
        SIGI = SIGMA(ISIGI)
C      FIXED PROD FCN FOR INTERMEDIATE ROCESS I.
        DO 180 IAQ = 1,NALPHA
        DO 180 ISIGQ = 1,NSIGMA
        AQ = ALPHA(IAQ)
        SIGQ = SIGMA(ISIGQ)
C      FIXED THE FINAL-STAGE PROD FCN.
C
C      NOW DECIDE PLACES OF PRODUCTION. FIRST, FOR X.
        CSTMIN = 10.0E30
        DO 170 ICX = US,CANADA
        DO 170 ICI = US, CANADA

```

```

C      IF(ICX .EQ. US .AND. ICI .EQ. US) GO TO 40
      IF(ICX .EQ. US .AND. ICI .EQ. CANADA) GO TO      50
      IF(ICX .EQ. CANADA .AND. ICI .EQ. US) GO TO      70
      IF(ICI .EQ. CANADA .AND. ICX .EQ. CANADA) GO TO  80

C
C      CASE 1 -- ALL PRODUCTION N U.S.
40  CONTINUE
      CX = 1./(1.-T(US))* CPERU(WAGE(US)*(1-TAXRAT(US)),R(US)-
1      T(US)*RSTAR(US), AX, SIGX, LABOR,CAPITL, RATIO)
      LOPTX = LABOR
      KOPTX = CAPITL
      PCOSTX = CX
      CVALX = PCOSTX
      CISTAR = CPERU(WAGE(US)*(1.-T(US)),R(US)-T(US)*RSTAR(US),
1      AI,SIGI, LABOR,CAPITL, RATIO)
      LOPTI = LABOR
      KOPTI = CAPITL
      PCOSTI = CISTAR/(1-TAXRAT(US))
      CQ = (1.+DUTYQ(IDUTYQ))*(1./(1.-TAXRAT(US)))*
1      CPERU(CISTAR,CX*(1.-T(US)),AQ,SIGQ,LABOR,CAPITL,RATIO)
      IOPT = LABOR
      XOPT = CAPITL
      CVALQ = CQ/(1+DUTYQ(IDUTYQ))
      PCOSTQ = CVALQ
      TOTCST(1,1) = CQ
      GO TO 110

C
C      SCENARIO 4 -- ELI LILLY RULE.
C      CASE II -- X IN US, I IN CANADA
50  CONTINUE
      CX = CPERU(WAGE(US)*(1-T(US)),R(US)-RSTAR(US)*T(US),AX, SIGX,
1      LOPT, KOPT, RATIO)
      CXRST = RSTAR(US)*KOPT + WAGE(US)*LOPT
      CXR = R(US)*KOPT + WAGE(US)*LOPT
      CVALX = CXR*(1+MARKUP)
      LOPTX = LOPT
      KOPTX = KOPT
      CIST = CPERU(WAGE(CANADA)*(1-T(CANADA)),R(CANADA)-RSTAR(CANADA)*
1      T(CANADA),AI,SIGI,LOPT,KOPT,RATIO)
      CISTST = RSTAR(CANADA)*KOPT + WAGE(CANADA)*LOPT
      PCOSTI = CIST/(1-T(CANADA))
      LOPTI = LOPT
      KOPTI = KOPT

C      INITIAL GUSS
      NITER = 0
      G = CX

C      START LOOP
60  P=(1./(1.-T(CANADA)))*CPERU(CIST,(G+CXR*(1+MARKUP)*DUTYX(IDUTYX))*
1      (1.-T(CANADA)),AQ,SIGQ,LABOR,CAPITL,RATIO)
      PCOSTQ = P
      IOPT = LABOR
      XOPT = CAPITL
      CVALQ = P
      DENOM = CPERU(CISTST,G+CXR*1.15*DUTYX(IDUTYX),
1      AQ,SIGQ,LABOR,CAPITL,RATIO)
      GPREV = G
      G = CX + TAXRAT(US)*P*CXRST/DENOM
      PCOSTX = G
      IF (ABS((G-GPREV)/GPREV) .LT. .001) GO TO 65
      IF (NITER .GT. 10) WRITE (6,1060) G,GPREV
1060 FORMAT (' CONVERGENCE TROUBLE:',2F14.6)
      NITER = NITER + 1
      IF(NITER .GT. 20) GO TO 65
      GO TO 60
65  TOTCST(1,2)=P
      GO TO 110

```

```

C      CASE III -- X(CANADA) I(US)
70  CONTINUE
    D = (1./ (1-T(CANADA))) * CPERU(WAGE(CANADA) * (1-T(CANADA))),
1    R(CANADA) - RSTAR(CANADA) * T(CANADA), AX, SIGX, LOPT, KOPT, RATIO)
    CXR = WAGE(CANADA) * LOPT + R(CANADA) * KOPT
    PCOSTX = D
    LOPTX = LOPT
    KOPTX = KOPT
    CVALX = CXR
    CXRST = RSTAR(CANADA) * KOPT + WAGE(CANADA) * LOPT
    CI = CPERU(WAGE(US), R(US), AI, SIGI, LABOR, CAPITL, RATIO)
    LOPTI = LABOR
    KOPTI = CAPITL
    PCOSTI = LOPTI * WAGE(US) + RBASE(US) * KOPTI
    G = D + CXR * 1.15 * DUTYX(IDUTYX)
    P = (CPERU(CI, G, AQ, SIGQ, LABOR, CAPITL, RATIO)
1    / (1.-T(US) * (1.-CXRST/D))) * (1.+DUTYQ(IDUTYQ))
    CVALQ = P / (1+DUTYQ(IDUTYQ))
    IOPT = LABOR
    KOPT = CAPITL
    PCOSTQ = CVALQ
    TOTCST(2,1) = P
    GO TO 110
80  CX = (1./ (1.-T(CANADA))) * CPERU(WAGE(CANADA) * (1-T(CANADA))),
1    R(CANADA) - RSTAR(CANADA) * TAXRAT(CANADA), AX, SIGX,
1    LABOR, CAPITL, RATIO)
    LOPTX = LABOR
    KOPTX = CAPITL
    PCOSTX = CX
    CIST = CPERU(WAGE(CANADA) * (1-T(CANADA)), R(CANADA) - RSTAR(CANADA) *
1    T(CANADA), AI, SIGI, LABOR, CAPITL, RATIO)
    LOPTI = LABOR
    KOPTI = CAPITL
    PCOSTI = CIST / (1-TAXRAT(ICI))
    CQ = (1./ (1-T(CANADA))) * CPERU(CIST, CX * (1.-T(CANADA)), AQ, SIGQ,
1    LABOR, CAPITL, RATIO)
    IOPT = LABOR
    KOPT = CAPITL
    PCOSTQ = CQ
    TOTCST(2,2) = CQ
    GO TO 110
110 CONTINUE
C  GET MINIMUM
    ALLOWST(ICX, ICI) = BLANK
    IF (CSTMIN .LE. TOTCST(ICX, ICI)) GO TO 170
    CSTMIN = TOTCST(ICX, ICI)
    ICXMIN = ICX
    ICIMIN = ICI
    WAGESX = XOPT * LOPTX * WAGE(ICX)
    WAGESI = IOPT * LOPTI * WAGE(ICI)
    CAPX = XOPT * KOPTX * RBASE(ICX)
    CAPI = IOPT * KOPTI * RBASE(ICI)
    DO 120 IC = 1,2
    WAGES(IC) = WAGESX * EQUAL(ICX, IC) + WAGESI * EQUAL(ICI, IC)
    CAP(IC) = CAPX * EQUAL(ICX, IC) + CAPI * EQUAL(ICI, IC)
    TARIFF(IC) = CVALX * DUTYX(IDUTYX) * XOPT * BORDER(ICX, ICI) * EQUAL(ICI, IC)
1    + CVALQ * DUTYQ(IDUTYQ) * BORDER(ICI, CANADA) * EQUAL(IC, CANADA)
    TAXES(IC) = EQUAL(ICX, IC) * (PCOSTX * XOPT - WAGESX - CAPX)
1    + EQUAL(ICI, IC) * (PCOSTI * IOPT - WAGESI - CAPI)
2    + EQUAL(ICI, IC) * (PCOSTQ - XOPT * (PCOSTX + CVALX * DUTYX(IDUTYX)
3    * BORDER(ICX, ICI)) - IOPT * PCOSTI)
    WAGES(IC) = PERC(WAGES(IC))
    CAP(IC) = PERC(CAP(IC))
    TARIFF(IC) = PERC(TARIFF(IC))
    TAXES(IC) = PERC(TAXES(IC))
    SUM(IC) = WAGES(IC) + CAP(IC) + TARIFF(IC) + TAXES(IC)
120 CONTINUE
170 CONTINUE
    ALLOWST(ICXMIN, ICIMIN) = ASTER

```

```

        ICOUNT(ICXMIN,ICIMIN)=ICOUNT(ICXMIN,ICIMIN) +1
        WRITE(6,1040) AX,SIGX,AI,SIGI,AQ,SIGQ,
$      ((TOTCST(ICX,ICI),ALOWST(ICX,ICI),ICI=US,CANADA),ICX=US,
$      CANADA)
1040 FORMAT(6F5.2,T35,4(F14.2,A1))
C      FOR THIS COMPLETE SET OF CHANGES ON ALPHA AND SIGMA,
C      DON'T WRITE VALUE ADDED BREAKDOWN.
C      WRITE(6,1020)(CNAME(IC),WAGES(IC),CAP(IC),TARIFF(IC),TAXES(IC),
C      1      SUM(IC),IC=US,CANADA)
1020 FORMAT(' VALUE ADDED AS % OF FINAL COST:',2(T35,A8,
1      ' WAGE',F6.1,' CAPITAL',F6.1,' TARIFF',F6.1,
2      ' TAXES',F6.1,' SUM',F6.1//))
180 CONTINUE
190 CONTINUE
        WRITE(6,1190) ((ICOUNT(ICX,ICI),ICI=US,CANADA),ICX=US,CANADA)
1190 FORMAT (' TOTAL NUMBER OF MINIMUM-COST CASES = ',4I15)
200 CONTINUE
        STOP
1000 FORMAT(T18,F5.2,4(15X,F5.2))
1010 FORMAT (1X,F8.3,T12,2F8.3,T32,2F8.3,T52,2F8.3, T72,2F8.3,
1      T92,2F8.3,/)
        END
        FUNCTION CPERU(WAGE, CAPCST,ALPHA,SIGMA,LABOR,CAPITL,PATIO)
        REAL LABOR
C      ALPHA, SIGMA -- PARAMETES OF C.E.S. PRODUCTION FUNCTION
C      WAGE, CAPCST -- WAGE AND CAPITAL COST.
C      LABOR, CAPITL -- LABOR AND CAPITAL REQUIRED FOR ONE UNIT OF
C      OUTPUT.
C      NOTE -- REAL LABOR AND CAPITAL, RESPECTIVELY.
C      RATIO -- CAPITAL-TO-LABOR RATIO (REAL)
C      CPERU -- COST PER UNIT OF OUTPUT.
        RATIO = (((1.-ALPHA)/ALPHA) * WAGE/CAPCST)**SIGMA
C      COMPUTE AMT PRODUCED WITH ONE (REAL) UNIT OF LABOR
        PRODUC = (ALPHA + (1-ALPHA)*RATIO **((1. -1./SIGMA))**
1      (SIGMA/(SIGMA-1.))
        LABOR = 1./PRODUC
        CAPITL = RATIO / PRODUC
        CPERU = LABOR*WAGE + CAPITL * CAPCST
        RETURN
        END
C      SCENARIO 4 -- CANADIAN TAX VALUATION BASED ON CUSTOMS
1050 FORMAT ('1 SCENARIO 4 -- CUSTOMS VALUATION FOR TAX -- ',
C      CASE II -- X(US) I(CANADA)
50 CONTINUE
        CX = CPERU(WAGE(US)*(1-T(US)),R(US)-T(US)*RSTAR(US),
1      AX,SIGX,LOPT,KOPT,RATIO) * (1/(1-T(US)))
        CXA = R(US)*KOPT + WAGE(US) * LOPT
        PCOSTX = CX
        LOPTX = LOPT
        KOPTX = KOPT
        CVALX = CXA*(1+MARKUP)
        CX = CX + CXA*DUTYX(IDUTYX)*(1+MARKUP)
        CIST = CPERU(WAGE(CANADA)*(1-T(CANADA)),
1      R(CANADA)-RSTAR(CANADA)*T(CANADA),AI,SIGI,LOPT,KOPT,RATIO)
        PCOSTI = CIST/(1-T(CANADA))
        LOPTI = LOPT
        KOPTI = KOPT
        P = (1/(1-T(CANADA)))*CPERU(CIST,CX-T(CANADA)*
1      (1+MARKUP)*(1+DUTYX(IDUTYX))*CXA,AQ,SIGQ,LOPT,KOPT,RATIO)
        PCOSTQ = P
        IOPT = LOPT
        XOPT = KOPT
        CVALQ = PCOSTQ
        TOTCST(1,2) = P
        GO TO 110
        CASE III - X(CANADA) I(USE)
70 CX = CPERU(WAGE(CANADA)*(1-T(CANADA)),
1      R(CANADA)-T(CANADA)*RSTAR(CANADA),AX,SIGX,LOPT,KOPT,RATIO)
2      * (1/(1-T(CANADA)))

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CXA = WAGE(CANADA)*LOPT + R(CANADA) * KOPT
PCOSTX = CX
CVALX = CX*(1+MARKUP)
LOPTX = LOPT
KOPTX = KOPT
CX = CX + CX*DUTYX(IDUTYX)*(1+MARKUP)
CIST = CPERU(WAGE(US)*(1-T(US)),R(US)-RSTAR(US)*T(US),
1      AI,SIGI,LOPT,KOPT,RATIO)
CIA = WAGE(US)*LOPT + R(US)*KOPT
PCOSTI = CIST/(1-T(US))
LOPTI = LOPT
KOPTI = KOPT
CQ = CPERU(CIST,CX-T(US)*CXA*(1+MARKUP)*(1+DUTYX(IDUTYX)),
1      AQ,SIGQ,LOPT,KOPT,RATIO)
COMPUTE P AS THE ECONOMIC COST OF Q PLUS DUTY
P = (1/(1-T(US)))*CQ +(CIA*LOPT+KOPT*CXA*(1+MARKUP)*
1      (1+DUTYX(IDUTYX)))*(1+MARKUP)*DUTYQ(IDUTYQ)
PCOSTQ = CQ/(1-T(US))
IOPT = LOPT
XOPT = KOPT
CVALQ = (CIA*LOPT + KOPT*CXA*(1+MARKUP)*(1+DUTYX(IDUTYX))) *
1      (1+MARKUP)
TOTCST(2,1) = P
GO TO 110

C      SCENARIO 4 -- INDEPENDENT FIRMS --
1050 FORMAT('///' SCENARIO 4 -- INDEPENDENT FIRMS -- ',
C      INDEPENDENT FIRMS
C      X(US) I(CANADA)
50 CX = (1/(1-T(US)))*CPERU(WAGE(US)*(1-T(US)),
1      R(US)-T(US)*RSTAR(US),AX,SIGX,LOPT,KOPT,RATIO) *
2      (1 + DUTYX(IDUTYX))
PCOSTX = CX/(1+DUTYX(IDUTYX))
LOPTX = LOPT
KOPTX = KOPT
CVALX = PCOSTX
CIST = CPERU(WAGE(CANADA)*(1-T(CANADA)),
1      R(CANADA)-T(CANADA)*RSTAR(CANADA), AI,SIGI,LOPT,KOPT,RATIO )
PCOSTI = CIST/(1-TAXRAT(ICI))
LOPTI = LOPT
KOPTI = KOPT
CQ = CPERU(CIST,CX*(1-T(CANADA)),AQ,SIGQ,LOPT,KOPT,RATIO) *
1      (1/(1-T(CANADA)))
IOPT = LOPT
XOPT = KOPT
PCOSTQ = CQ
CVALQ = PCOSTQ
TOTCST(1,2)=CQ
GO TO 110

C
C      X(CANADA) I(US)
70 CX = (1/(1-T(CANADA)))* CPERU(WAGE(CANADA)*(1-T(CANADA)),
1      R(CANADA)-RSTAR(CANADA)*T(CANADA),AX,SIGX,LOPT,KOPT,RATIO)
2      *(1+DUTYX(IDUTYX))
LOPTX = LOPT
KOPTX = KOPT
PCOSTX = CX/(1+DUTYX(IDUTYX))
CVALX = PCOSTX
CIST = CPERU(WAGE(US)*(1-T(US)), R(US)-RSTAR(US)*T(US),
1      AI,SIGI,LOPT,KOPT,RATIO)
LOPTI = LOPT
KOPTI = KOPT
PCOSTI = CIST/(1-TAXRAT(ICI))
CQ = (1/(1-T(US)))*CPERU(CIST,CX*(1-T(US)),AQ,SIGQ,LOPT,KOPT,
1      RATIO) * (1+DUTYQ(IDUTYQ))
IOPT = LOPT
XOPT = KOPT
PCOSTQ = CQ/(1+DUTYQ(IDUTYQ))
CVALQ = PCOSTQ
TOTCST(2,1) = CQ
GO TO 110

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Bibliography

CASES CITED

Canada Safeway Limited v. M.N.R. (1957) S.C.R. 717

Dominion Bridge Company Limited v. The Queen (1975) C.T.C. 63, 75 D.T.C. 5150

Jesse Hall et ux. v. Commissioner 32TC 390 (1959) aff'd. 294 F 2d 82 (1961)

J.W. Hofert, Ltd v. M.N.R. (1962) D.T.C. 50

Re Huber Homes Inc., 55TC 589 (1971)

International Canadian Corp. 308 F. 2d 520 (C.A. 9, 1962)

Eli Lilly and Company v. U.S., 372 F 2d 990 (1967)

PPG Industries Inc. v. Commissioner 55TC 93 (1970)

REFERENCES

Adelman, M.A. (1972) *The International Petroleum Market* (Baltimore: Johns Hopkins University Press)

Alchian, A. and H. Demsetz (1972) 'Production information costs and economic organization.' *American Economic Review* 62, 777-95

Barone, E. (1908) 'Il Ministerio della Produzione nello State Collectivist.' *Giornale degli Economisti e Rivista de Statistica*. Transl. in F.A. Hayek, ed., *Collectivist Economic Planning* (London)

Berndt, E.R. and L.R. Christensen (1973) 'The internal structure of functional relationships: separability, substitution and aggregation.' *Review of Economic Studies* 40, 403-10

Bossons, J.W. (1972) 'The potential role of a value added tax in Canada.' In Canadian Tax Foundation, *Proceedings of the Twenty Fourth Tax Conference* 341-7

- Burgess, D.F. (1976) 'Tariffs and income distribution: some empirical evidence for the United States.' *Journal of Political Economy* 48, 17-46
- Business International Corp. (1965) *Solving International Pricing Problems* (New York: BIC)
- Canada, Royal Commission on Energy (1958) *First Report* (Ottawa)
- Canada, Statistics Canada (monthly) *Canadian Statistical Review* (Ottawa)
- (1968) *Labour Costs in Manufacturing, 1968*
- Canada, Treasury Board (1976) *Benefit Cost Analysis Guide* (Ottawa)
- Copithorne, L.W. (1971) 'International transfer prices and government policy.' *Canadian Journal of Economics* 4, 324-41
- 'The theory of corporate transfer pricing.' Mimeo.
- Daly, D.J., B.A. Keys, and E.J. Spence (1968) *Economics of Scale and Specialization in Canadian Manufacturing* Economic Council of Canada, Staff Studies No. 21 (Ottawa)
- Dean, J. (1951) *Managerial Economics* (Englewood Cliffs: Prentice Hall)
- Denny, M. and J.D. May (1978) 'Homotheticity and real value-added in Canadian manufacturing.' In M. Fuss and D. McFadden, eds, *Production Economics: A Dual Approach to Theory and Application* (Amsterdam, North-Holland)
- Diewert, W.E. (1974) 'Applications of duality theory.' In M. Intriligator and D. Kendrick, eds, *Frontiers of Quantitative Economics* (Amsterdam: North Holland)
- Dresch, S.P., A.L. Lin, and D.K. Stout (1977) *Substituting a Value-Added Tax for the Corporate Income Tax*. Fiscal Studies No. 15 (Cambridge, Mass.: Bullinger, for the National Bureau of Economic Research)
- Due, J.R. (1970) 'Proposals for a federal value-added tax.' *Illinois Business Review* 6-8
- Fisher, I. (1930) *The Theory of Interest* (New York: Macmillan)
- Gordon, M.J. and E. Shapiro (1956) 'Capital equipment analysis: the required rate of profit.' *Management Science* 3, 102-10
- Gould, J. (1964) 'Internal pricing in firms where there are costs of using an outside market.' *Journal of Business* 37, 61-7
- Griliches, Z. and V. Ringstad (1971) *Economies of Scale and the Form of the Production Function* (Amsterdam: North Holland)
- Hanoch, G. (1975) 'Production and demand models with direct and indirect implicit additivity.' *Econometrica* 43, 395-420
- Hirshleifer, J. (1956) 'On the economics of transfer pricing.' *Journal of Business* 29, 172-84
- (1957) 'Economics of a divisionalized firm.' *Journal of Business* 30, 96-108
- Horst, T.O. (1969) 'A theoretical and empirical analysis of American exports and direct investments.' Doctoral dissertation, University of Rochester

- (1971) 'The theory of the multinational firm: optimal behavior under different tariff and tax rates.' *Journal of Political Economy* 79, 1050-72
 - (1975a) 'American taxation of multinational corporations.' Unpublished working paper
 - (1975b) 'Tax issues.' Mimeo.
- Howe, J.D. and D.G. McFetridge (1976) 'The Determinants of R and D expenditures.' Ontario Economic Council Working Paper (Toronto)
- Kindleberger, C.P., ed. (1970) *The International Corporation: A Symposium*, (Cambridge, Mass.: MIT Press)
- Lange, O. and F.M. Taylor (1938) *On the Economic Theory of Socialism*. Ed. B.E. Lippincott (Minneapolis, University of Minnesota Press)
- Lévesque, R.J. (1967) 'The shifting of the corporate income tax in the short run.' Royal Commission on Taxation, Study No. 18 (Ottawa, Queen's Printer)
- Lewis, D. (1972) *Louder Voices, the Corporate Welfare Bums* (Toronto: James Lewis and Samuel)
- O'Keefe, M.J. (1975) 'Management fees and withholding tax.' *Canadian Tax Journal* 23, 130-7
- Prentice Hall Inc., *U.S. Taxation of International Operations* (looseleaf service)
- Price, Waterhouse & Co. (various dates) *Guide for U.S. Corporations Doing Business Abroad* (New York: P.W. & Co.)
- Quirin, G.D. (1967) *The Capital Expenditure Decision* (Homewood, Irwin)
- Quirin, G.D., R.M. Sultan, and T.A. Wilson (1970) *The Canadian Appliance Industry* (Toronto, Institute for the Quantitative Analysis of Social and Economic Policy)
- Quirin, G.D. and B.A. Kalymon (1977) 'The financial position of the petroleum industry.' In J.C. Watkins and M. Walker, ed., *Oil in the Seventies* (Vancouver, The Fraser Institute) 215-41
- Shulman, J.S. (1966) 'Transfer pricing in multinational business.' Doctoral dissertation, Harvard University
- Sloan, A.P. jr (1963) *My Years at General Motors*. Ed. J.D. Macdonald with Catherine Stevens (Garden City, New York: Doubleday and Company)
- Solomon E. (1955) 'Measuring a company's cost of capital.' *Journal of Business* 28, 240-52
- (1956) 'The arithmetic of capital budgeting decisions.' *Journal of Business* 29, 124-9
- Tamaki, G.T. and R.W. Pound (1974) 'Intercompany pricing: in search of guidelines.' *Canadian Tax Journal* 22, 460-71
- Tarbell, Ida M. (1904) *A History of the Standard Oil Company* (New York)
- US Bureau of Labour Statistics (annual) *Handbook of Labour Statistics* 1973, 1974

- Verlage, H.C. (1975) *Transfer Pricing for Multinational Corporations*
(Rotterdam: Rotterdam University Press)
- Ward, D.A. (1975) 'Allocation of income and expense items.' In Canadian Tax
Foundation, *Corporate Management Tax Conference*
- Watkins, M.F. et al. (1968) *Foreign Ownership and the Structure of Canadian
Industry* (Ottawa, Queen's Printer)

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16 Fiscal Transfer Pricing in Multinational Corporations

G.F. MATHEWSON and G.D. QUIRIN

The scope of transfer price manipulation by multinational corporations is relatively limited, but certain problems do arise which all open economies must face. This volume is a study of the economic problems created by fiscal transfer pricing, as well as the relevance of these problems in an international and purely Canadian context. By means of extensive examination and analysis, first of the general institutional framework within which transfer price manipulation occurs, together with the opportunities and constraints presented within such a framework, the reader is shown practical results of the multinational organization's ability successfully to manipulate transfer prices.

The authors adopt a 'pseudo-empirical' approach, using Canada and the United States as a case study. Transfer pricing is possible only within the context of a multinational organization, where there is no arm's-length market present for the commodity in question. Moving from these premises to an examination of the structures of Canadian trade, the authors identify those markets in which multinationals are unimportant, those in which they are important but influenced by competitive prices, and those in which a great deal of trade takes place in goods for which other outside markets are of restricted importance. The principal finding of the analysis is that multinationals have a relatively restricted scope for transfer price manipulation, but useful recommendations are made for tightening Canadian regulations and for their enforcement.

G.F. MATHEWSON is a member of the Department of Economics at the University of Toronto.

G.D. QUIRIN is in the Faculty of Management Studies, University of Toronto.

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